

STRUCTURE OF MICROCARD

A01/1 = Structure of microcard

A03/1 = Special features, general instructions, safety measures, testers and tools, test specifications, tightening torques

B01/1 = Repair

N25/1 = Index

N27/1 = Table of contents

N28/1 = Editorial note

Continue: A02/1 Fig.: A01/2

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A	XXXXX	XXXXX	XXXXX	XX							
B	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXX					
C	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXX					
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E	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XX					
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	12345	67890	12345	67890	12345	678					
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Continue: A02/1

STRUCTURE OF MICROCARD

The user prompting appears on every page, e.g.:

- Continue: B17/1

- Continue: B18/1 Fig.: B17/2

.../1 = Upper coordinate half

.../2 = Lower coordinate half

Continue: A03/1

SPECIAL FEATURES

These instructions describe repair of:

- * In-line pumps of series PE(S)..R..S 1000, without governor, LDA, timing device and supply pump.**

Disassembly and assembly of the various types of governor are to be performed in line with the respective repair instructions.

Continue: A04/1

GENERAL INFORMATION

Miscellaneous:

These repair instructions cover all repair operations for in-line pumps of size "R", series "S 1000".

The various types of in-line pump are given in the corresponding service-parts lists.

Worn and damaged parts are to be scrapped.

Continue: A04/2

GENERAL INSTRUCTIONS

Miscellaneous:

Always renew sealing elements.

If injection-pump components are to be stored for a lengthy period, they should be covered and protected against rusting.

Wash out plunger-and-barrel assemblies and delivery-valve assemblies in cleaning agent: Moisten plungers with calibrating oil.

Rub over sealing rings with tallow.

Continue: A05/1

GENERAL INFORMATION

The following jaw couplings are ONLY to be used for pump repair:

- 1 686 430 038**
- 1 686 430 040**

Testing of the pumps with the stated couplings is not permitted for reasons of rigidity.

Repairs can also be performed with the test-type drive flanges indicated in these instructions.

Continue: A06/1

SAFETY MEASURES

Cleaning of components:

Wash out components in cleaning agent such as chlorothene NU, which is both commercially available and not readily flammable.

Pay attention to the following safety regulations !!!

In Germany:

Order Governing Work with Combustible Liquids (Vbf) as published by Federal Labor Ministry (BmA).

Continue: A06/2

SAFETY MEASURES

Safety regulations for handling chlorinated hydrocarbons

Companies **ZH 1 / 222**

Employees **ZH 1 / 129**

**as published by the Main Body of the Liability Insurance Associations (Central Association for Accident Prevention and Industrial Medicine))
Langwartweg 103, 53129 Bonn.**

In all other countries attention is to be paid to the corresponding local regulations.

Continue: A07/1

SAFETY MEASURES

EXCLUSIVE use is to be made of the special tools listed in these repair instructions.

INJURIES CANNOT BE RULED OUT if these tools are not used !

Continue: A07/2

SAFETY MEASURES

The procedure outlined in the Sections "REMOVING ROLLER TAPPET" and "FITTING ROLLER TAPPET" must be performed with extreme care. If not, there is a danger of sudden plunger-return-spring tension relief and INJURY CANNOT BE PRECLUDED!

Continue: A08/1

TESTERS, FIXTURES AND TOOLS

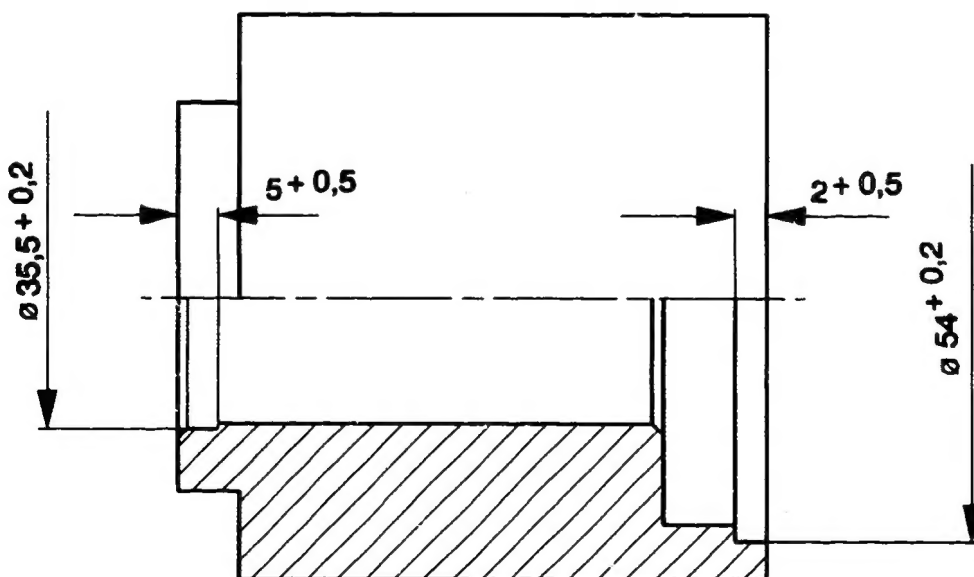
The introduction of new camshaft bearing sizes has made it necessary to modify an existing tool.

The pressing-in tool 0 986 612 065 (KDEP 1552) is to be reworked as shown in the drawing. This modification does not affect the operations to be performed with said tool.

The modification has already been incorporated into new tools ordered ex store.

Continue: A09/1 Fig.: A08/2

KMK05197



TESTERS, FIXTURES AND TOOLS

* Puller	0 986 611 668
	KDEP 1056
* Support sleeve	0 986 611 676
	KDEP 1056/0/8
Removal of end covers from tappet retaining holes	
* Insertion tool	0 986 611 738
	KDEP 1071
Insertion of control sleeves	

Continue: A09/2

TESTERS, FIXTURES AND TOOLS

* Assembly tool	0 986 612 072
	KDEP 1556
+ Tubular lever from	0 986 611 993
	KDEP 1505
+ Angular holder (supplement to 0 986 612 072)	0 986 612 636
Pressing down roller tappets	
* Assembly sleeve	0 986 612 060
	KDEP 1549
Protection of cylindrical roller bearing on drive end when installing camshaft	

Continue: A10/1

TESTERS, FIXTURES AND TOOLS

- * Spacer plates 0 986 612 061
KDEP 1550
For placing beneath barrel-and-
valve assemblies
- * Pressing-in tool 0 986 612 659
For pressing cylindrical roller
bearing into bearing end plate
- * Pressing-in tool 0 986 612 065
+
Guide bushing 0 986 612 493
+
Adapter ring 0 986 612 646
For pressing in roller bearing on
governor end

Continue: A10/2

TESTERS, FIXTURES AND TOOLS

- * Holding wrench 0 986 612 071
in conjunction with KDEP 1555
jaw couplings:
1 686 430 038 and ..040
For counterholding and turning
camshaft
- * Hook wrench 1 687 950 530
in conjunction with
drive flanges:
1 685 702 073, ..074 and ..075
For counterholding and turning
camshaft

Continue: A11/1

TESTERS, FIXTURES AND TOOLS

- * Pressing-on tool 0 986 612 085
 KDEP 1585
For fitting radial-lip-type
oil seal in bearing end plate
- * Support ring 0 986 612 106
 KDEP 1568
For supporting pump housing during
assembly operations on screw press

Continue: A11/2

TESTERS, FIXTURES AND TOOLS

- * Fixture 0 986 612 107
 KDEP 1569
For pressing roller bearings in and
out
- * Puller 0 986 612 111
 KDEP 1570
For removing bearing ring from
bearing end plate
- * Retaining pin 0 986 612 114
 KDEP 1571
For plunger retention during
leak test

Continue: A12/1

TESTERS, FIXTURES AND TOOLS

- * Pressing-in mandrel 0 986 612 119
 KDEP 1574
For knocking base covers in
and out
- * Pliers 0 986 612 120
 KDEP 1575
For removal and insertion of pump
plungers
- * Pin-type socket wrench 0 986 612 129
 KDEP 1577
For screwing threaded bushings at
control rod in and out

Continue: A12/2

TESTERS, FIXTURES AND TOOLS

- * Pressing-off plate 0 986 612 134
 KDEP 1580
For pressing off roller bearing on
governor end (inner race)
- * Pressing-in mandrel 0 986 612 156
 KDEP 1598
For pressing end covers into
tappet retaining holes
- * Assembly tool 0 986 612 325
 KDEP 1714
For installation of snap ring on
barrel-and-valve assembly

Continue: A13/1

TESTERS, FIXTURES AND TOOLS

- * Puller 0 986 612 397
KDEP 1763
Removal of barrel-and-valve
assemblies
- * Extractor hook 0 986 611 292
KDEP 2938
Removal of plunger springs
- * Tappet forceps 0 986 611 298
KDEP 2938
Removal and installation of
roller tappets
- * Tappet holder 0 986 612 482
Holding up roller tappets

Continue: A13/2

TESTERS, FIXTURES AND TOOLS

- * Assembly tool for
timing device 0 986 611 309
KDEP 2944
- Socket wrench 0 986 611 310
KDEP 2944/0/1
- Pin-type sock. wrench 0 986 611 311
KDEP 2944/1
- Extractor mandrel 0 986 611 314
KDEP 2944/2
- Removal and attachment of timing
devices with 20 mm taper.
- * Fitting tool 0 986 611 356
KDEP 2962
- Accommodation of barrel-and-
valve assembly

Continue: A14/1

TESTERS, FIXTURES AND TOOLS

- * Support clamp 0 986 611 358
KDEP 2963
Pumps with flange attachment
- * Clamping device 0 986 611 441
KDEP 2985
+ Clamping strips 0 986 612 649
(adapter)
Fixture for bottom attachment
- * Socket wrench 0 986 611 451
KDEP 2986
Loosening of delivery-valve holders

Continue: A14/2

TESTERS, FIXTURES AND TOOLS

- * Box wrench 0 986 611 452
KDEP 2997
Turning barrel-and-valve assemblies
- * Directional-control valve 0 986 615 111
KDJE-P 100/1.1
Pressure reduction for leak test
- * Drive flange 1 685 702 073
Taper 35 - short
- * Drive flange 1 685 702 074
Taper 35 - long

Continue: A15/1

TESTERS, FIXTURES AND TOOLS

* Drive flange Taper 40 - short	1 685 702 075
* Jaw coupling Taper 35 - short	1 686 430 038
* Jaw coupling Taper 35 - long	1 686 430 040
* Socket wrench Turning tappet retainers	0 986 612 489
* Centering mandrel Assembly of roller tappets	0 986 612 492

Continue: A15/2

TESTERS, FIXTURES AND TOOLS

* Assembly tool Fitting of O-ring/support rings on barrel-and-valve assembly	0 986 612 495
* Puller Removal of impact caps	0 986 612 498
* Spring tensioner Tensioning control-rod return spring	0 986 612 311
* Puller Removing bearing end plate	0 986 612 505

Continue: A16/1

TESTERS, FIXTURES AND TOOLS

- * Assembly sleeve 0 986 612 606
Fitting O-ring on delivery-
valve holder
- * Puller 0 986 612 630
Removing self-aligning
roller bearing on governor end
- * Pressing-out mandrel 0 986 612 660
Pressing radial-lip-type oil
seal out of bearing end plate
+
Pressing bearing out of bearing
end plate, taper 35 (only if rollers
cannot be removed)

Continue: A16/2

TESTERS, FIXTURES AND TOOLS

- * Pressing-off mandrel 0 986 612 648
Pressing out roller bearing on
drive end - taper 40
- * Pressing-in tool 0 986 612 647
Pressing in roller bearing/
radial-lip-type oil seal on drive end
- taper 40

Continue: A17/1

TEST SPECIFICATIONS

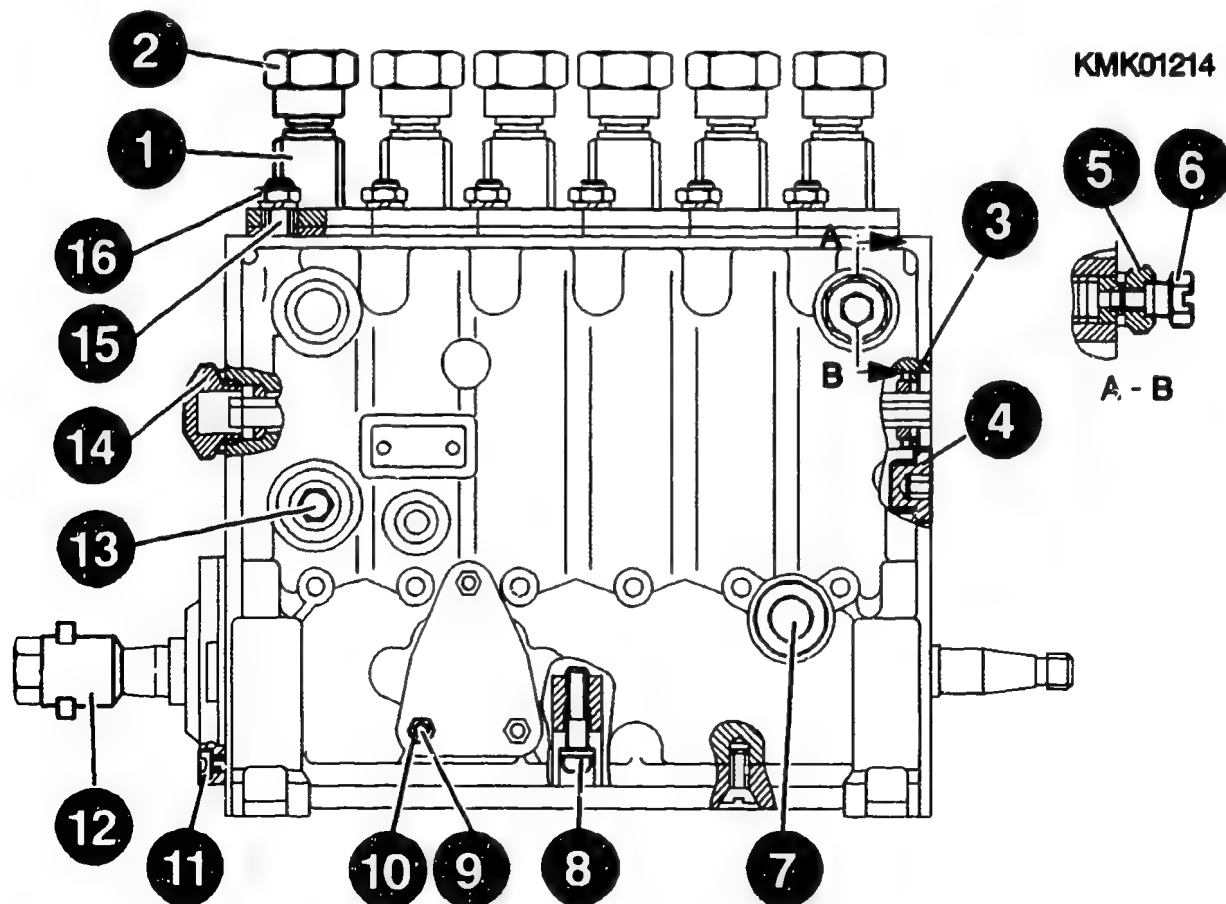
- * Leak test - suction gallery
8 minutes at 5 bar, then 1 minute
pulsating 0 ... 5 bar.
- * Leak test - camshaft, spring and
governor chamber
7 minutes at 1.5 bar, then
1 minute at 0.5 bar.

Continue: A18/1

TIGHTENING TORQUES

1 = Delivery-valve holder	110...120 Nm
2 = Cap nut	max. 25 Nm
3 = Control-rod guide	
bushing	30... 40 Nm
4 = Screw plug	40... 50 Nm
5 = Threaded bushing	20... 30 Nm
6 = Bleeder screw	4... 5 Nm
7 = Reducer bushing	
M 14 x 1.5	20... 25 Nm
M 16 x 1.5	30... 40 Nm
8 = Fillister-head screw	7... 9 Nm
for steel intermediate bearing	+ 90 degrees!
9 = Threaded pin	3.5...4.5 Nm
10= Hexagon nut	7... 9 Nm

Continue: A19/1 Fig.: A18/2



TIGHTENING TORQUES

11= Bearing end-plate attachment

Fill.-head screw	M 6	7...	9	Nm
Torx bolt	M 6	10...	12	Nm
Torx bolt	M 8	18...	20	Nm
Hex. socket-head cap screw	M 6	10...	12	Nm
	M 8	18...	20	Nm

12= Couplings and timing device

Union nut:

M 14 x 1.5	85...	100	Nm
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M 18 x 1.5	100...	120	Nm
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Hexagon nut:

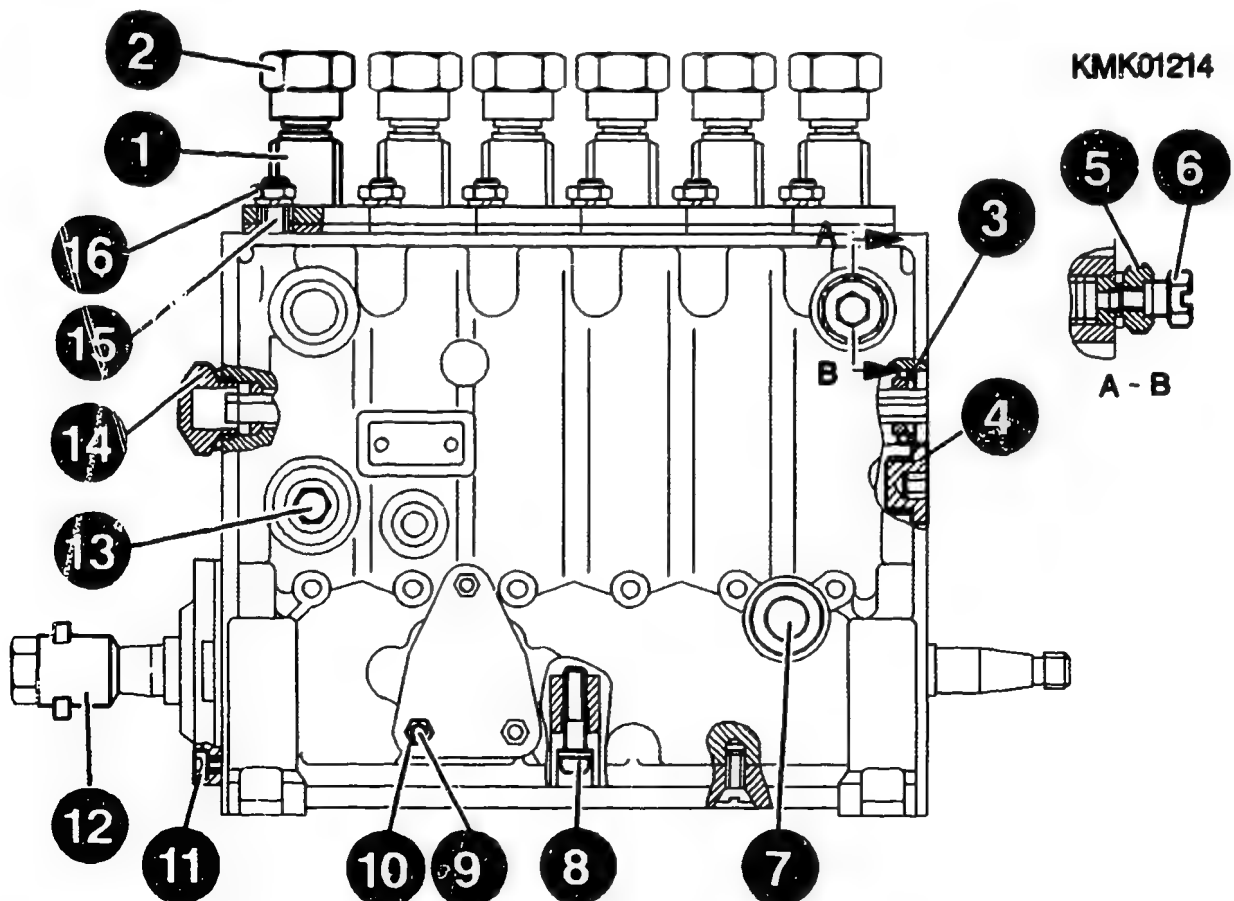
M 18 x 1.5	100...	110	Nm
------------	--------	-----	----

M 20 x 1.5	180...	210	Nm
------------	--------	-----	----

M 24 x 1.5	340...	370	Nm
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M 30 x 1.5	450...	490	Nm
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Continue: A20/1 Fig.: A19/2

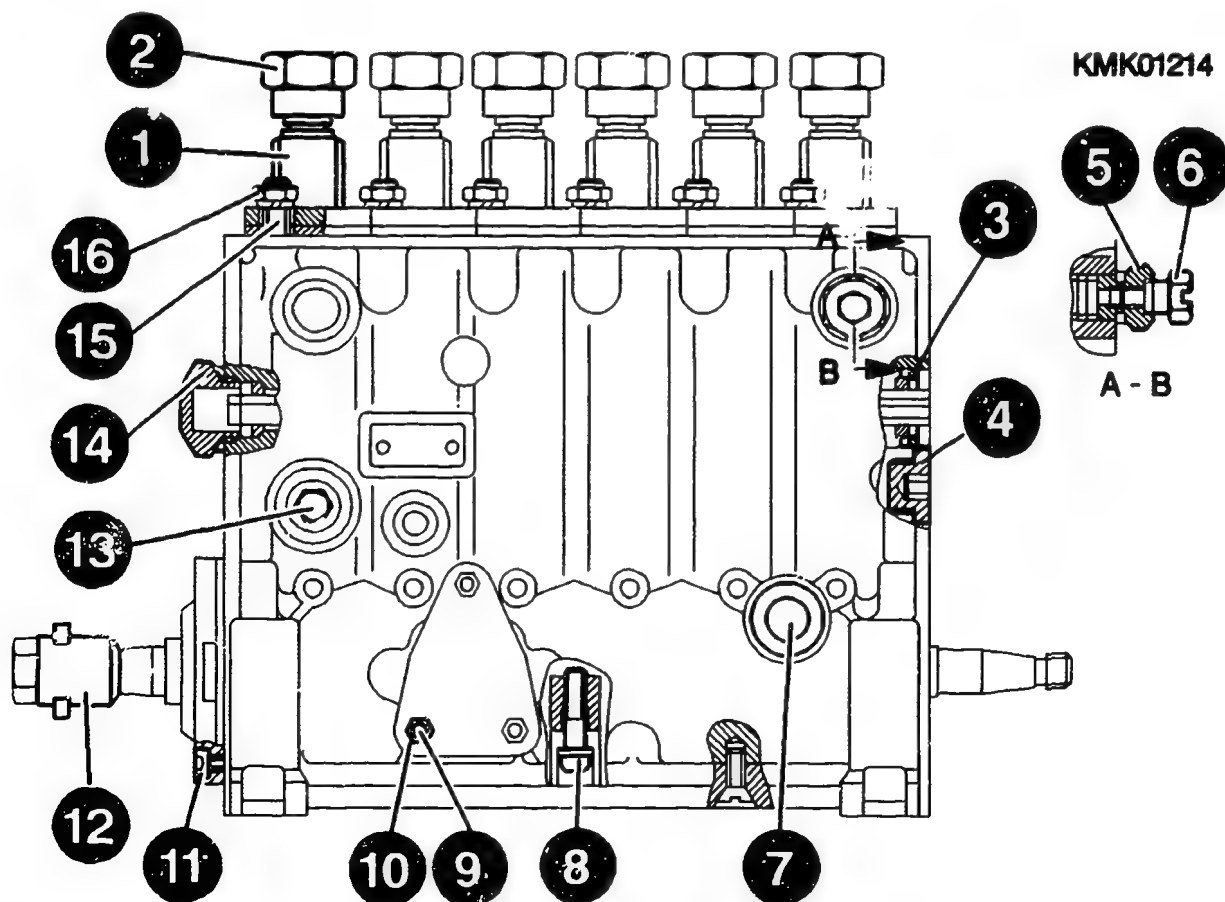


TIGHTENING TORQUES

13= Screw plug
14= Closing cap
15= Threaded pin
16= Hexagon nut

40... 60 Nm
40... 60 Nm
25... 30 Nm
50... 55 Nm

Continue: A21/1 Fig.: A20/2

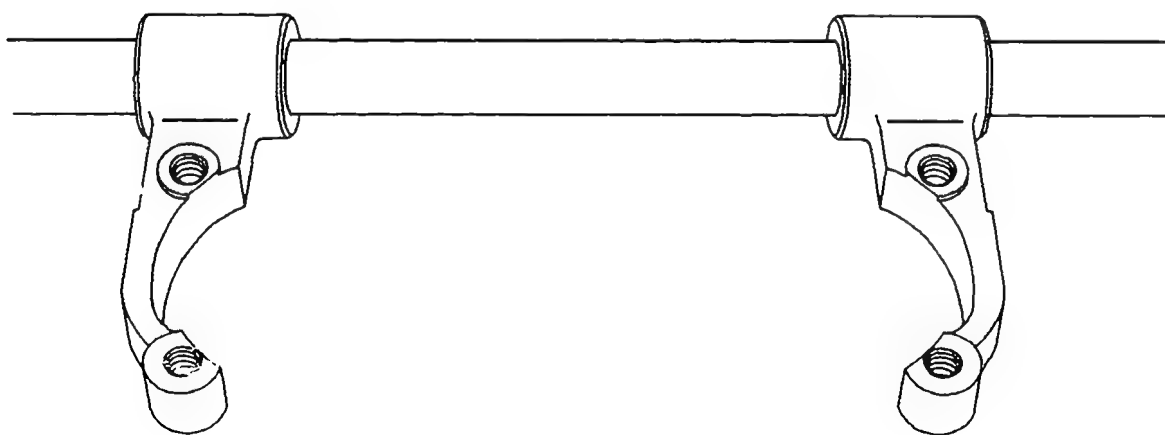


**DISASSEMBLING FUEL-INJECTION PUMP
(WITHOUT GOVERNOR)**

**Mount clamping device 0 986 611 451
(KDEP 2985) on rotatable clamping frame
0 986 611 248 (KDEP 2919).**

Continue: B02/1 Fig.: B01/2

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DISASSEMBLING FUEL-INJECTION PUMP (WITHOUT GOVERNOR)

Screw additional clamping strips
(adapter) 0 986 612 649 onto clamping
strips already fitted.

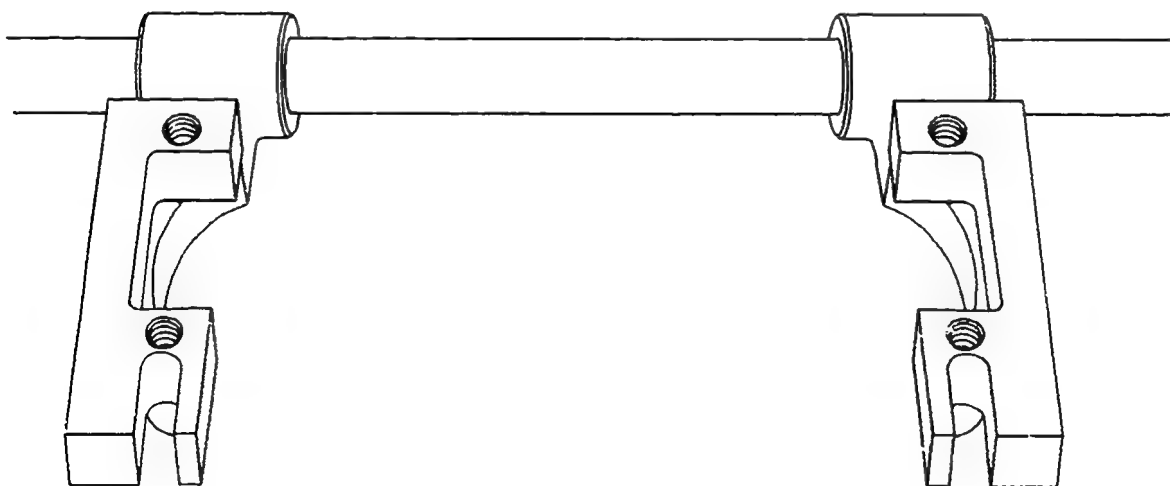
Note:

Screw on additional clamping strips
such that M8 thread points towards
clamping strips 0 986 611 451
(KDEP 2985).

Length of M8 fastening bolts is to be
selected such that bolts do not pro-
trude into M10 threaded section of
additional clamping strips.

Continue: B03/1 Fig.: B02/2

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FITTING DRIVE COUPLING

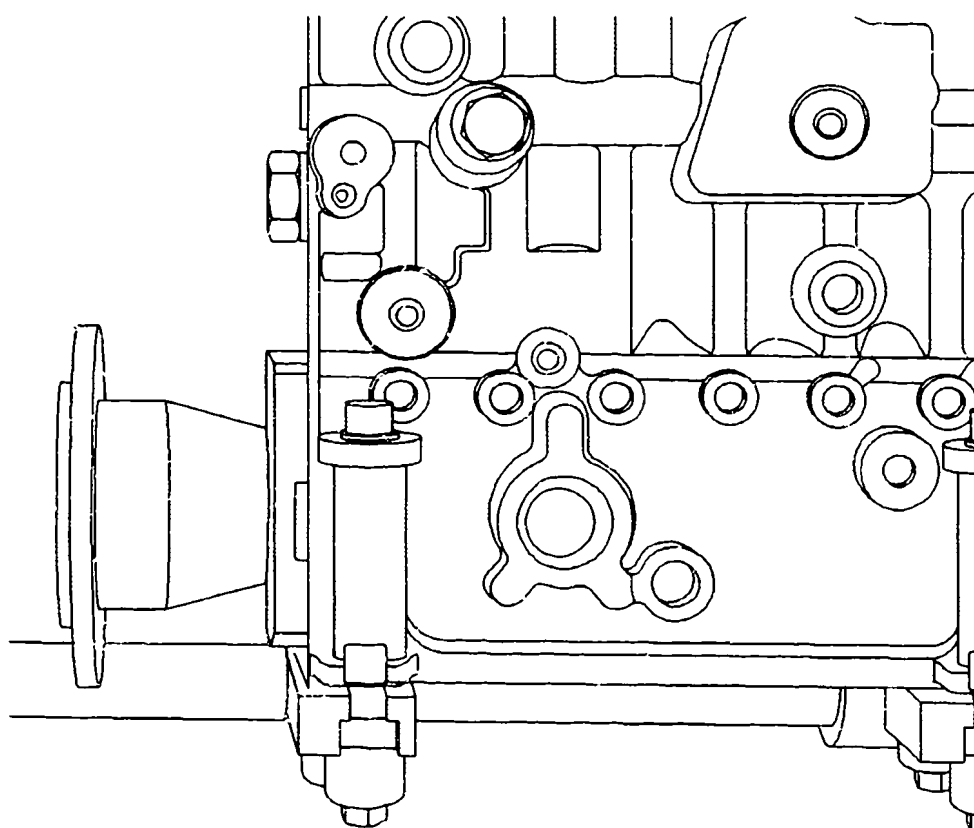
Install in-line pump PE..R.. on clamping device.

Pumps with flange attachment require use of the clamp holder 0 986 611 358 (KDEP 2963) with suitable attachment flanges.

Fit drive flange 1 685 702 074 (alternatively jaw coupling 1 686 430 040).

Disassemble governor in line with appropriate repair instructions.

Continue: B04/1 Fig.: B03/2



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REMOVAL OF PRESTROKE SHIM

Losen fastening nuts of barrel-and-valve assemblies and continue turning approx. 3 turns.

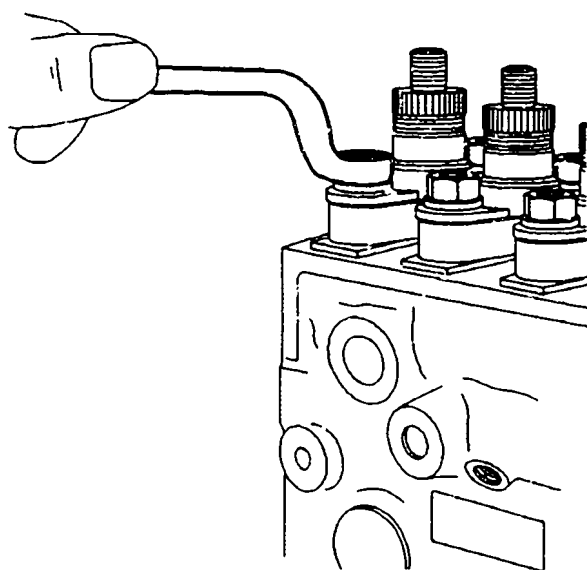
Raise barrel-and-valve assemblies with a screwdriver and remove prestroke shims.

Note:

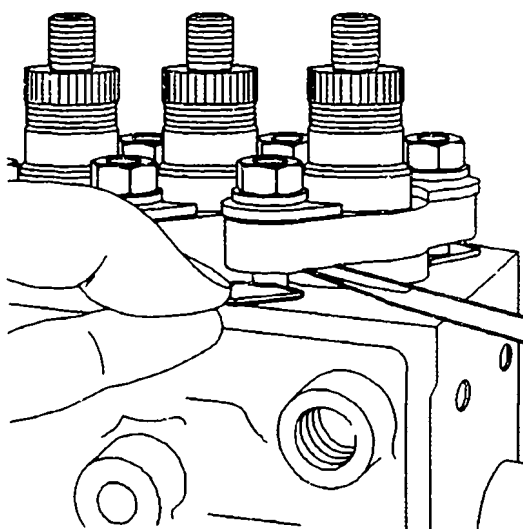
The prestroke shims are paired in terms of thickness.

It is therefore advisable to store them accordingly.

Continue: B05/1 Fig.: B04/2



KMK01217



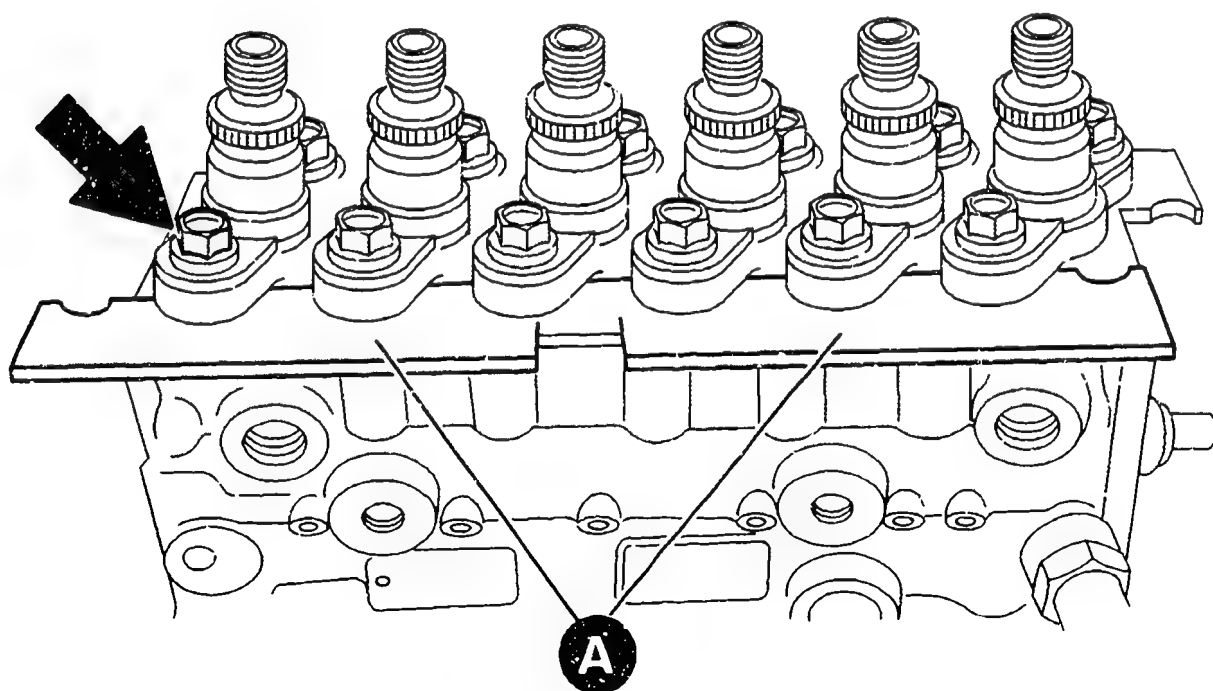
**INSERTING SPACER PLATES 0 986 612 061
(KDEP 1550)**

Insert spacer plates (fig. A) 0 986 612 061 (KDEP 1550) in place of prestroke shims beneath assembly flanges.

Tighten fastening nuts (arrow) again by hand as a temporary measure.

Continue: B06/1 Fig.: B05/2

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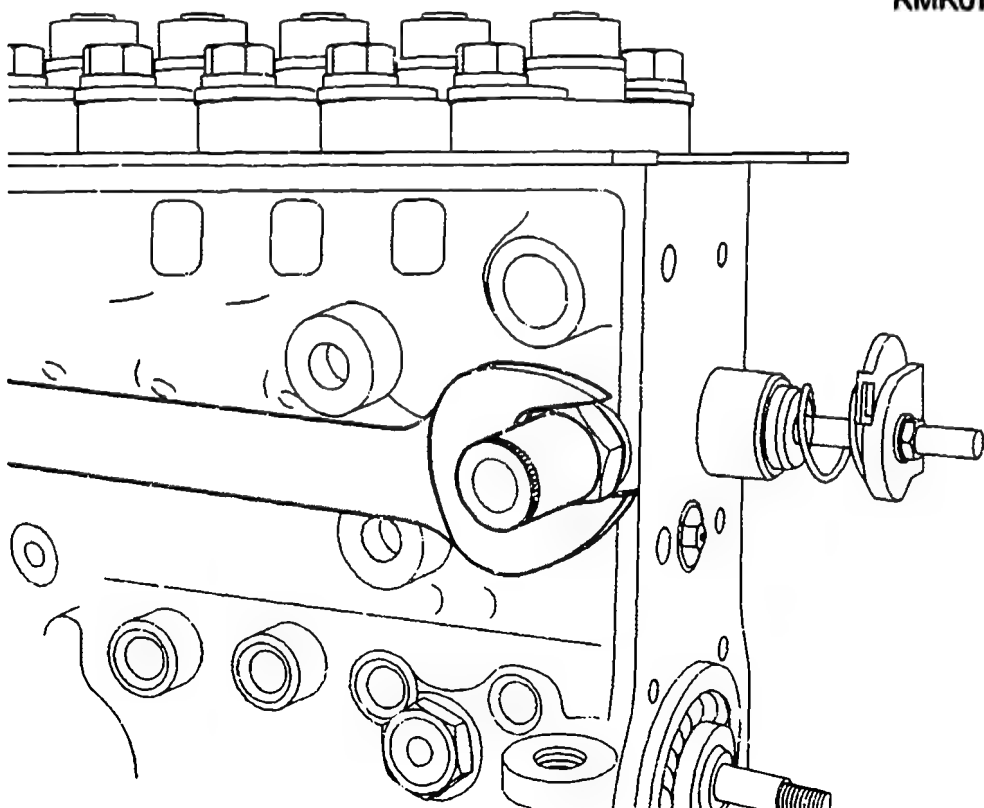


REMOVING ADD-ON MODULES

Screw out overflow valve.

Continue: B07/1 Fig.: B06/2

KMK01219

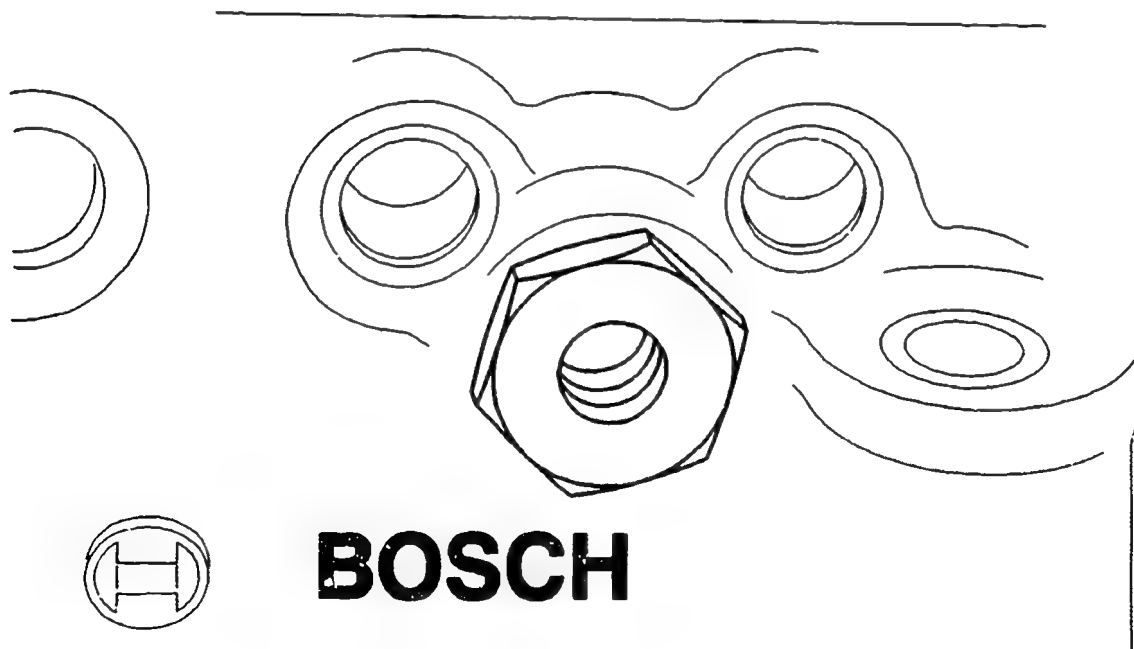


REMOVING ADD-ON MODULES

Screw out connecting nipple of oil
return if fitted.

Continue: B08/1 Fig.: B07/2

KMK01220



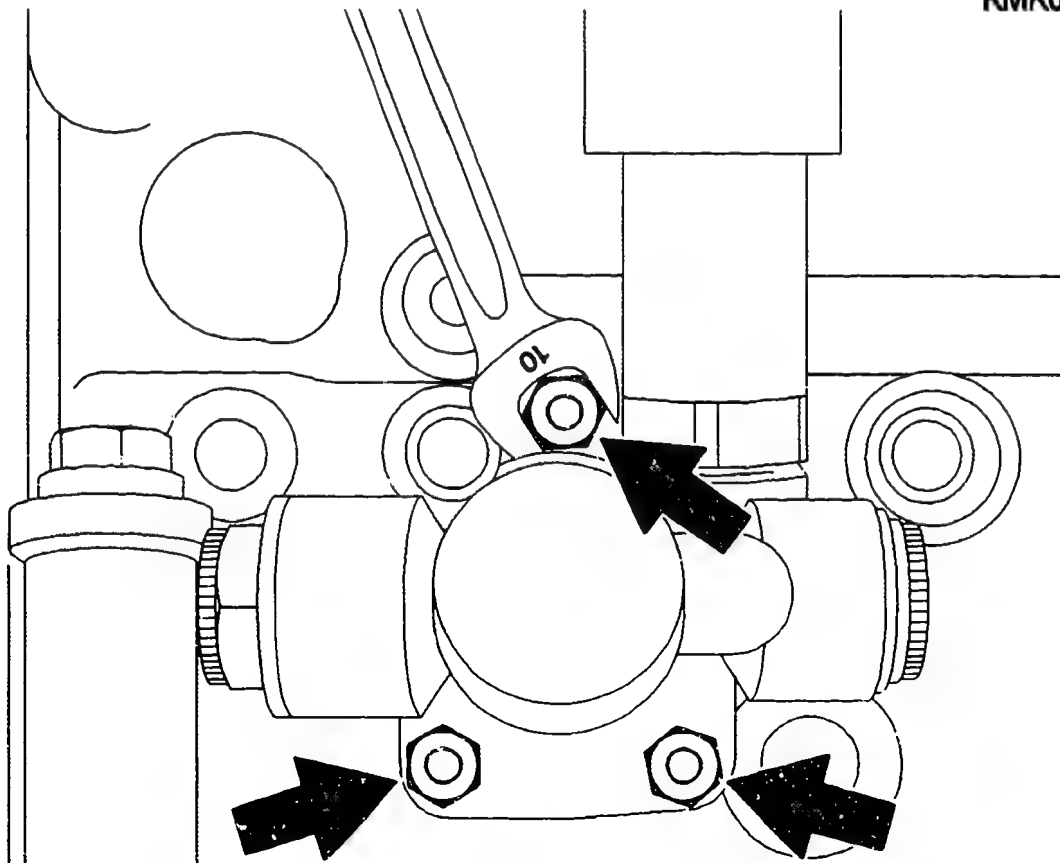
REMOVING SUPPLY PUMP

Losen and unscrew hexagon nuts
(arrows).

Remove supply pump and seal.

Continue: B09/1 Fig.: B08/2

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DISASSEMBLING END COVERS

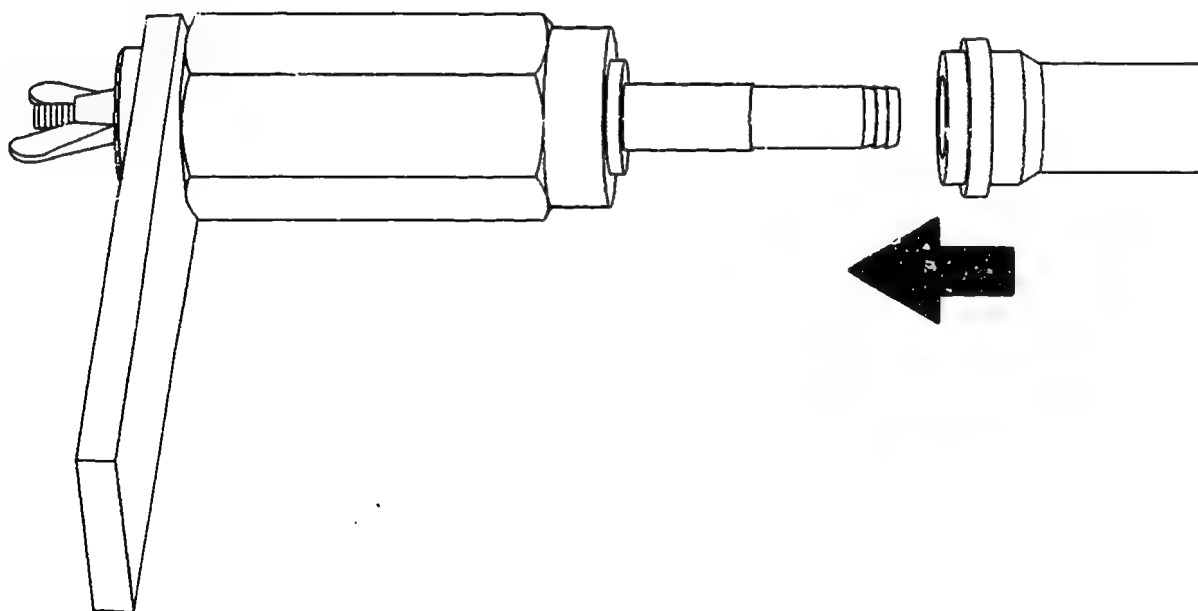
Attach support sleeve 0 986 611 676 (KDEP 1056/0/8) to fixture 0 986 611 668 (KDEP 1056) (arrow).

Turn back wing nut of fixture and insert puller 0 986 611 668 (KDEP 1056) into end cover.

Screw in wing nut as far as possible so as to straddle collet chuck of fixture in end cover.

Continue: B10/1 Fig.: B09/2

KMK05201

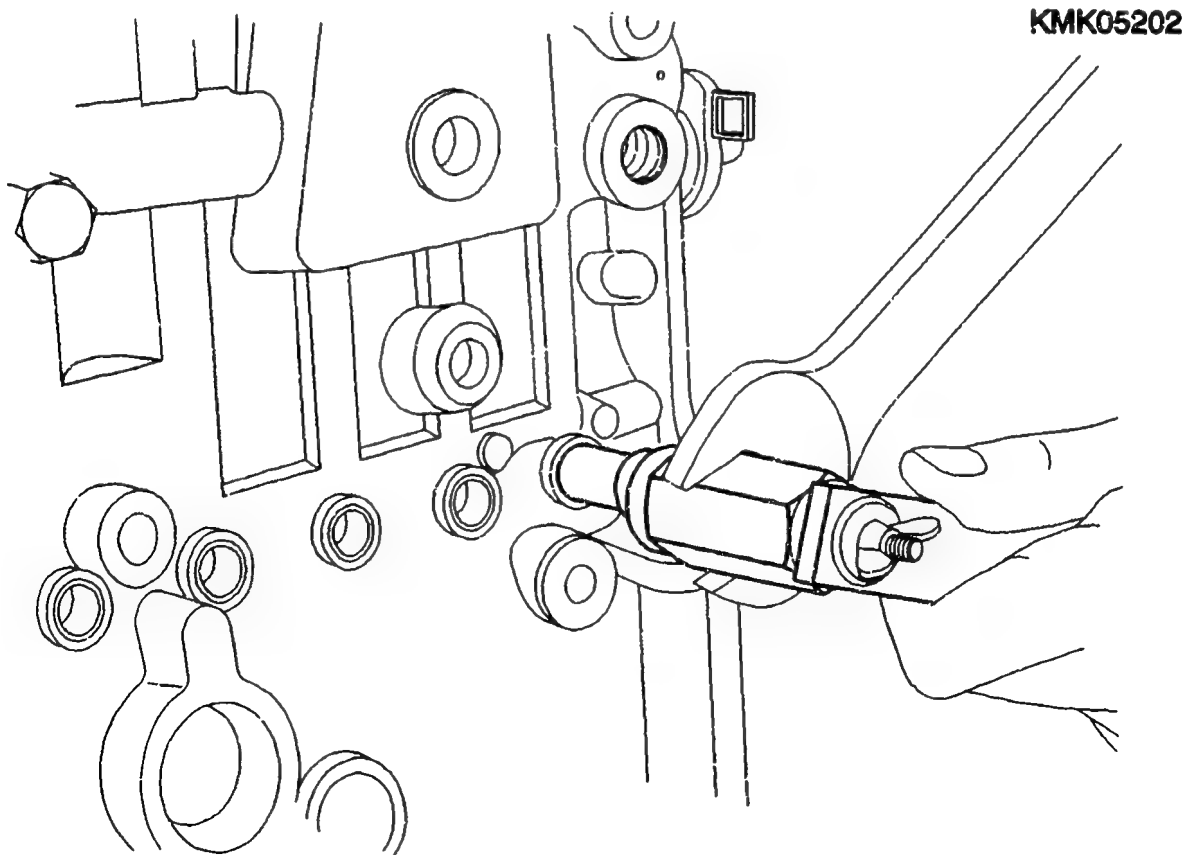


DISASSEMBLING END COVERS

Hold handle of fixture and turn sleeve of puller with wrench until end cover is pulled out of pump housing.

Remove end cover from fixture and scrap it. Re-use is not permitted.

Continue: B11/1 Fig.: B10/2



INSTALLING TAPPET HOLDER

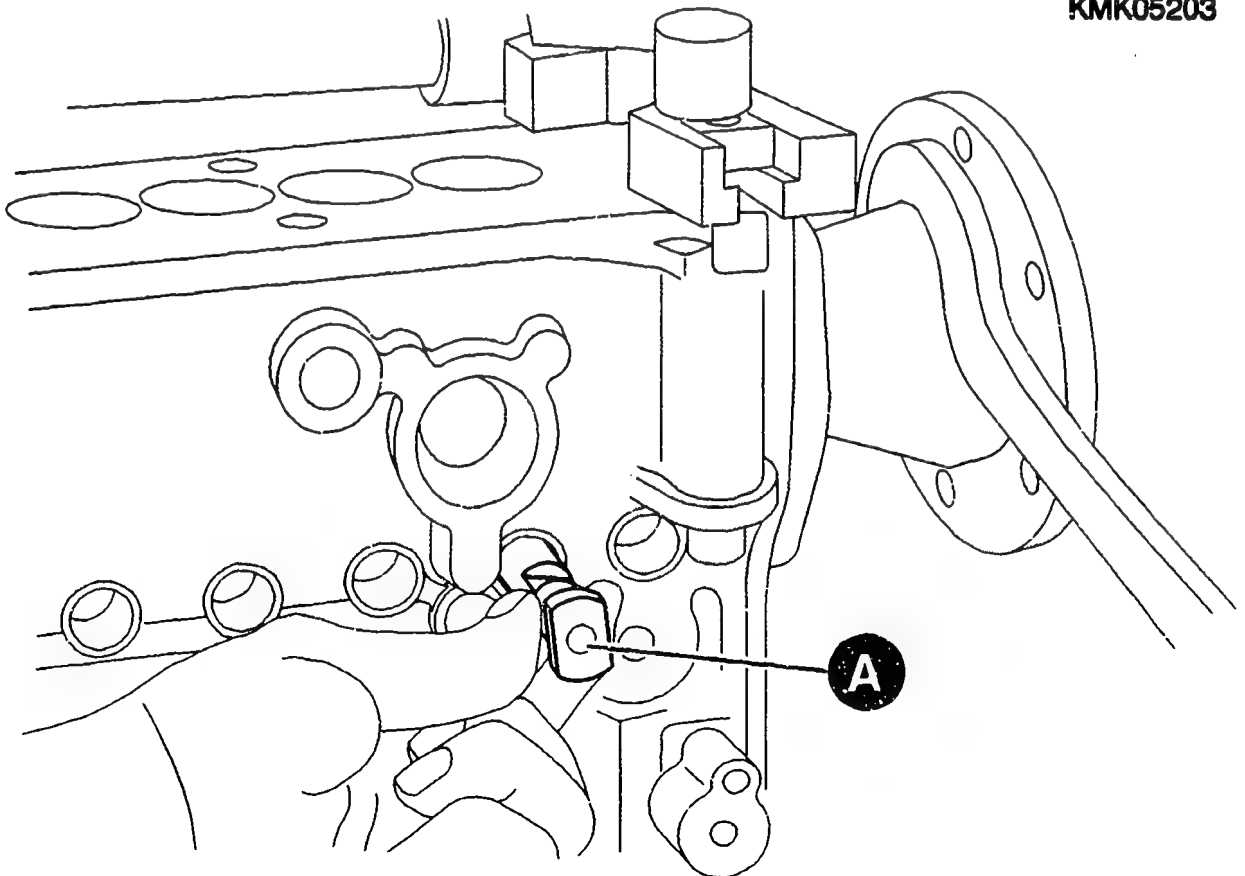
Turn injection pump round such that delivery-valve holders face downwards.

Attach hook wrench 1 687 950 530 to drive coupling.

Provided that tappet retaining hole is not covered by roller tappet, immediately insert tappet holder 0 986 612 482 (fig. A).

Continue: B12/1 Fig.: B11/2

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INSTALLING TAPPET HOLDER

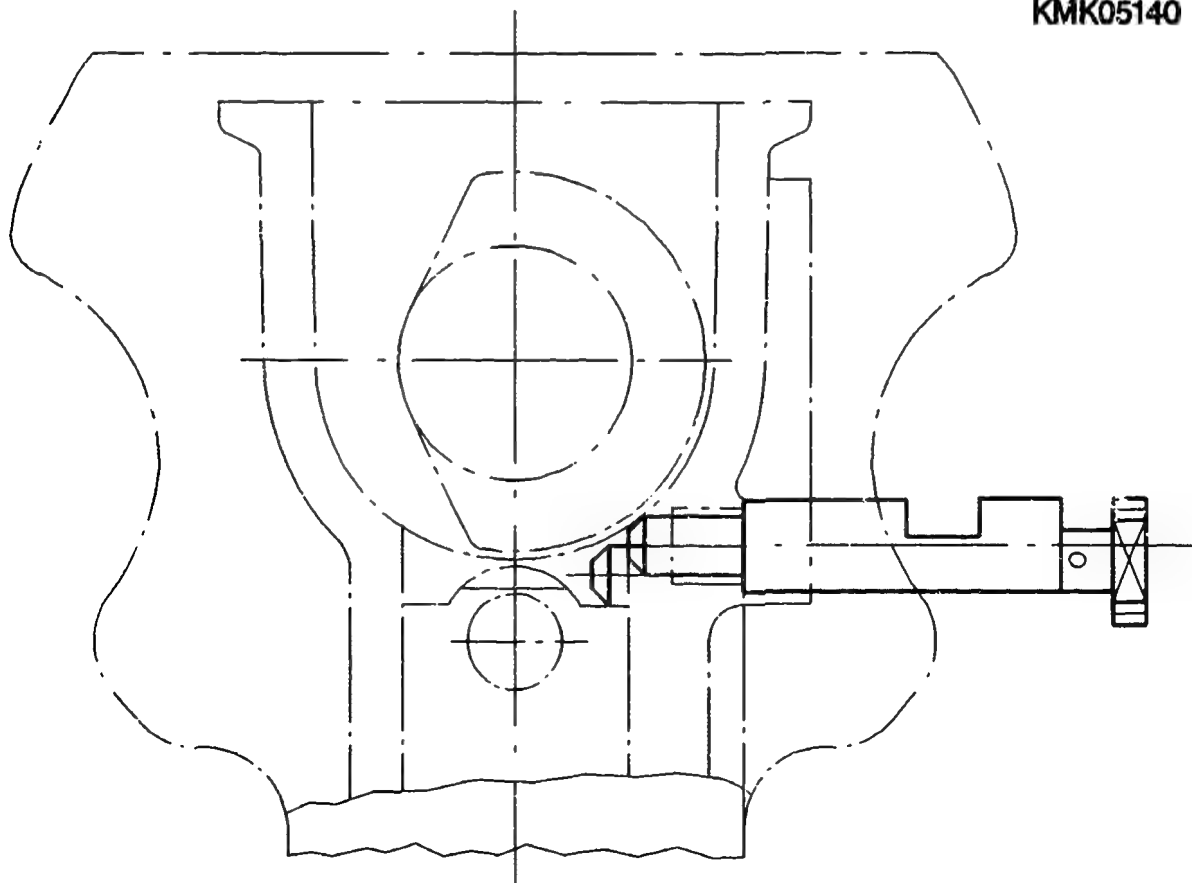
Before inserting tappet holders 0 986 612 482, camshaft is to be turned to move respective roller tappet to OT position.

This opens up the mounting hole in the pump housing for insertion of the tappet holder.

Insert tappet holder into mounting hole until it makes contact with housing; turn camshaft slightly if necessary.

Continue: B13/1 Fig.: B12/2

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INSTALLING TAPPET HOLDER

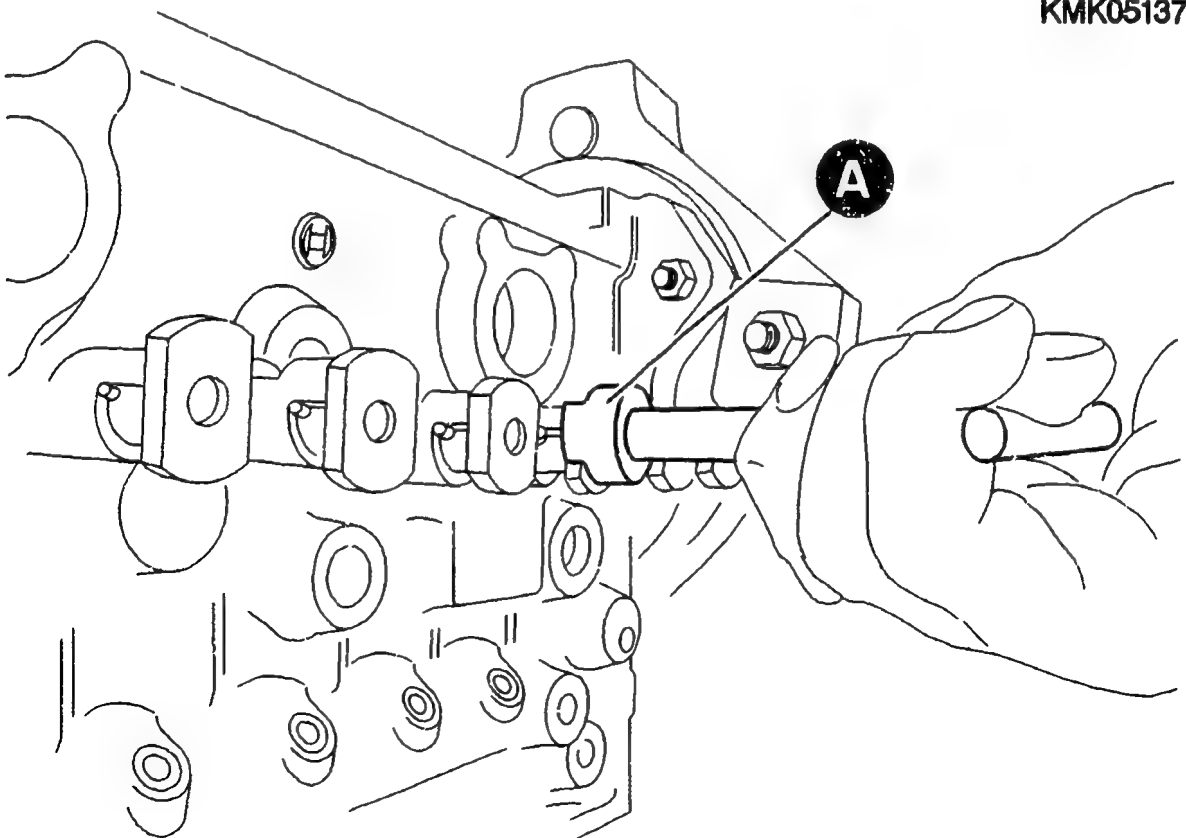
The "0" marks made in the body of the fixture and on the end face of the modified handle face upwards (towards center of camshaft).

The milled surface must be horizontal. After inserting tappet holder, use socket wrench 0 986 612 489 (fig. A) to turn eccentric shaft through 180 degrees, thus lifting roller tappet off cam.

Make sure that the sleeve does not turn during adjustment.

Continue: B14/1 Fig.: B13/2

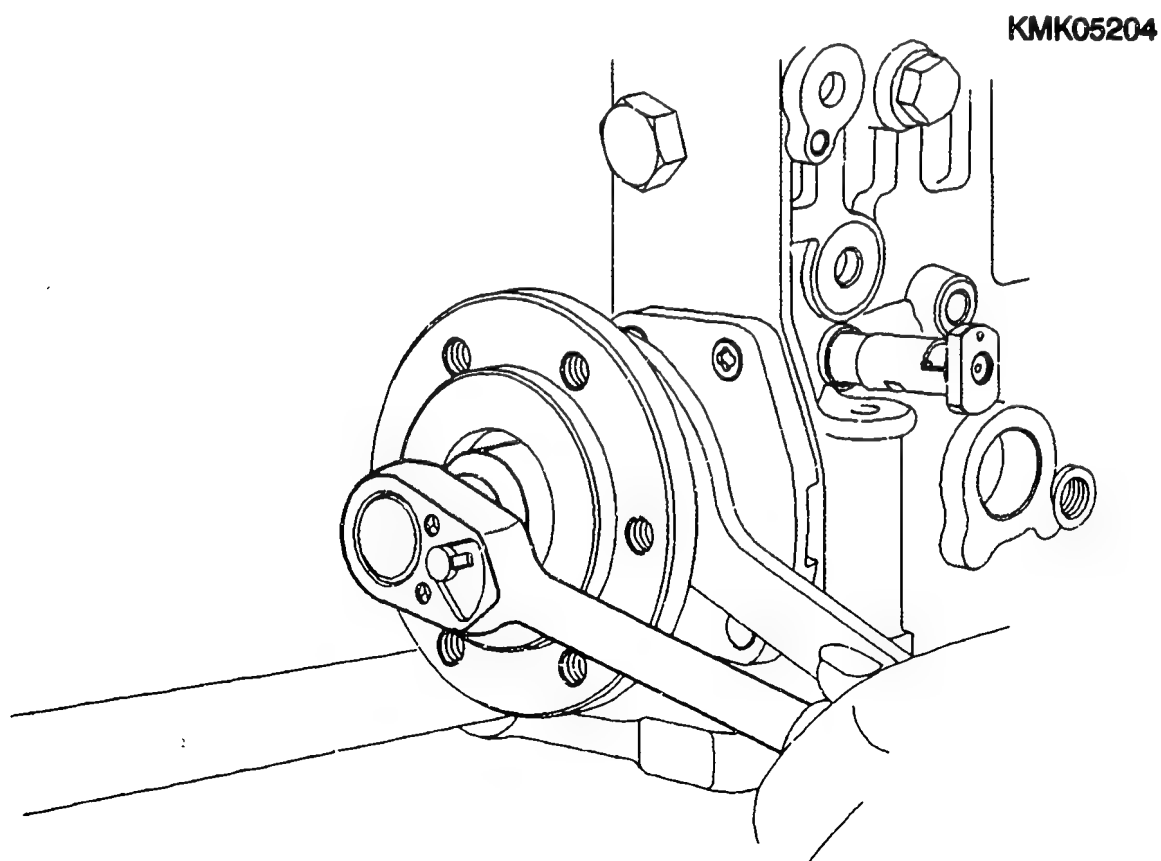
KMK05137



REMOVING DRIVE COUPLING

Counterhold drive flange with hook wrench and pull off.

Continue: B15/1 Fig.: B14/2

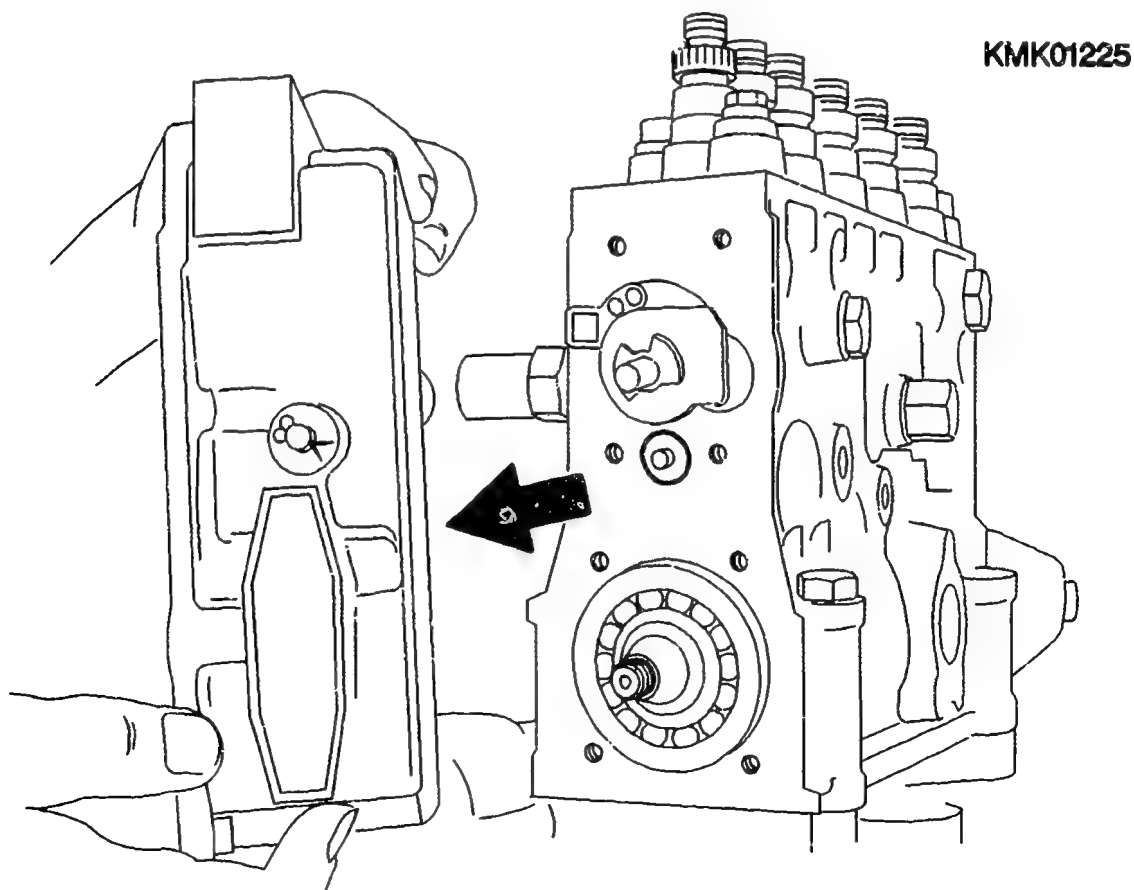


DISASSEMBLING GOVERNOR HOUSING

Loosen and screw out fastening screws
of governor housing.

Remove governor housing; take off seal.

Continue: B16/1 Fig.: B15/2



REMOVAL OF CAMSHAFT

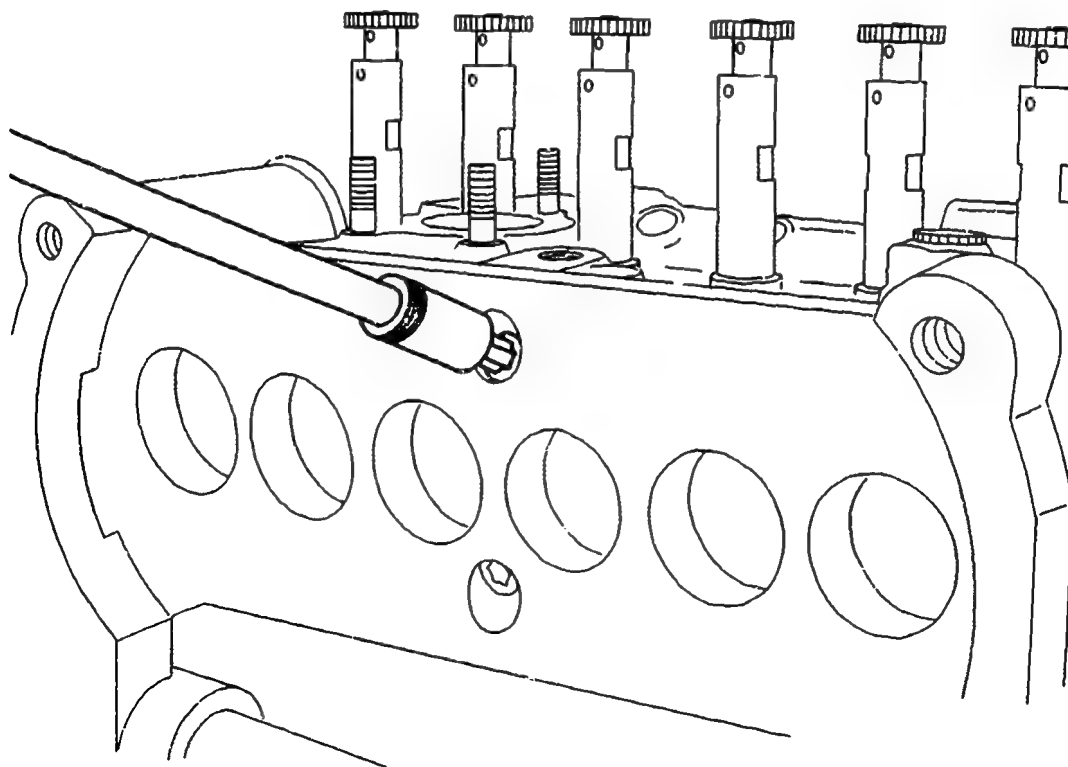
Loosen fastening screws of camshaft intermediate bearing and screw out. Remove resilient sleeves.

Note:

Fastening screws are to be scrapped and replaced with new ones.

Continue: B17/1 Fig.: B16/2

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CAMSHAFT REMOVAL - SELF-ALIGNING ROLLER BEARING

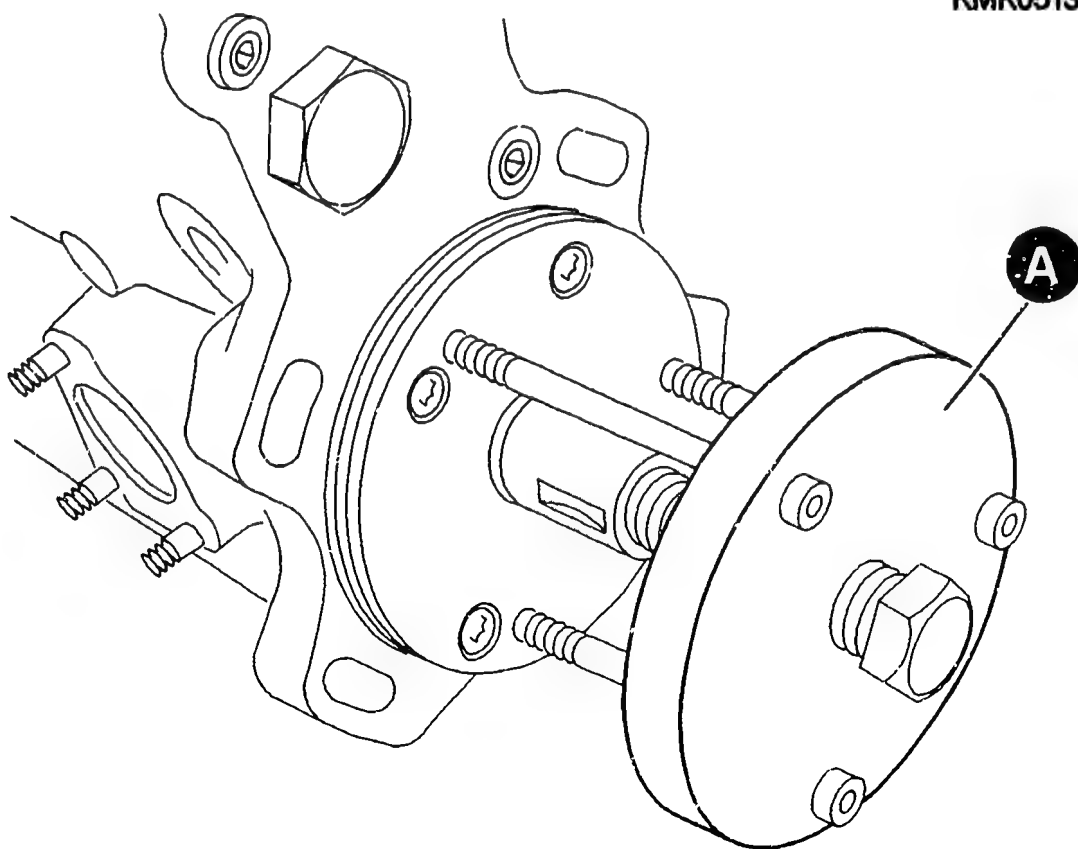
**Loosen and screw out fastening screws
of bearing end plate.**

**Attach puller 0 986 612 505
(fig. A) with three M6 bolts to
bearing end plate.**

**Turn pressing-off screw (M16x1.5)
against camshaft until bearing end
plate can be removed from pump
housing.**

Continue: B18/1 Fig.: B17/2

KMK05138



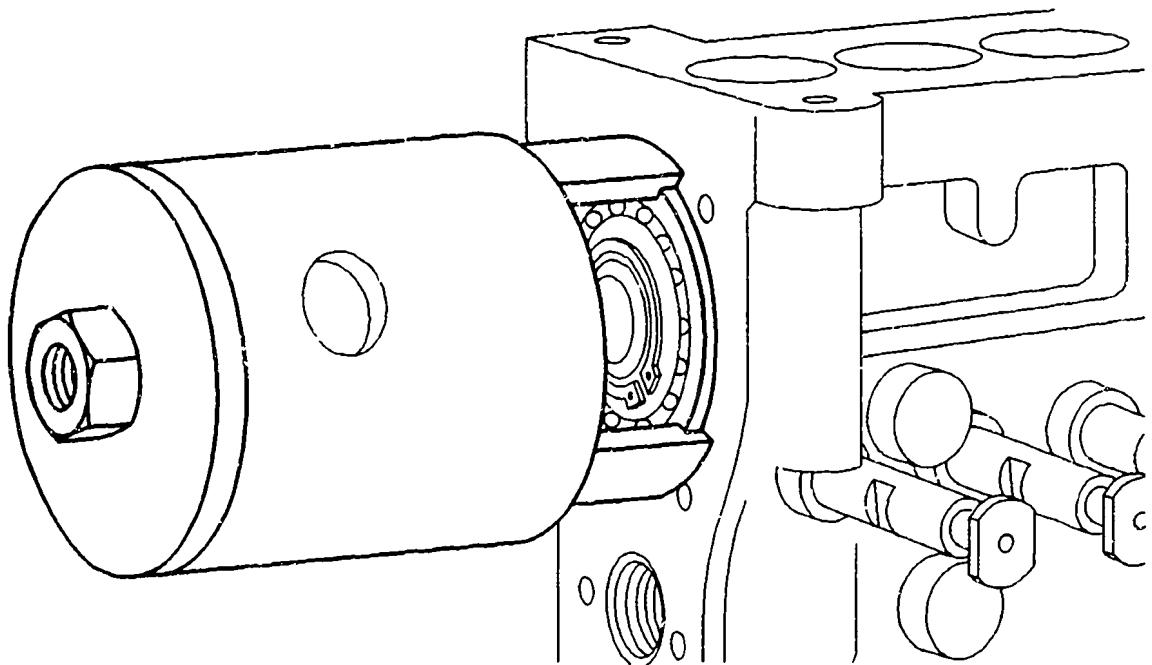
CAMSHAFT REMOVAL - SELF-ALIGNING ROLLER BEARING

**Insert two-piece spring collet of
puller 0 986 612 630 in angular groove
at outer race of camshaft bearing on
governor end.**

**Position bell end of puller such that
it makes contact with pump housing.**

Continue: B19/1 Fig.: B18/2

KMK01227



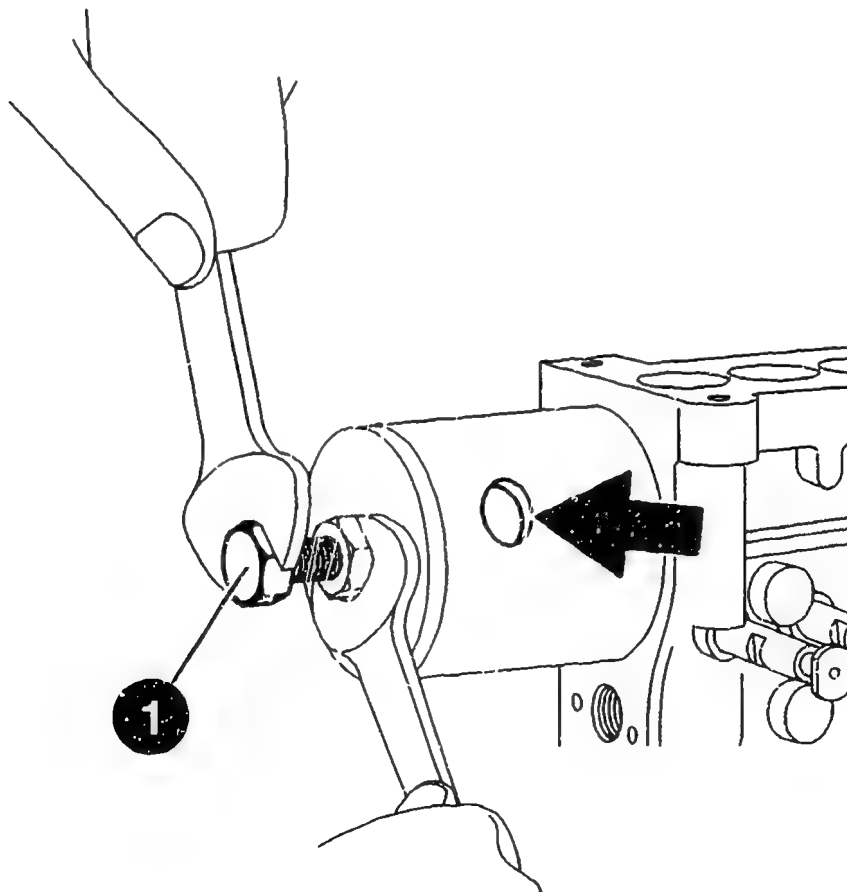
CAMSHAFT REMOVAL - SELF-ALIGNING ROLLER BEARING

Insert puller screw with nut through center bore in bell end of puller 0 986 612 630 and screw into support plate of inner collet. Check position through inspection hole in bell end (arrow).

To pull out bearing with camshaft, hold screw with open-end wrench and turn nut (1) with second wrench.

Continue: B20/1 Fig.: B19/2

KMK01228



CAMSHAFT REMOVAL - SELF-ALIGNING ROLLER BEARING

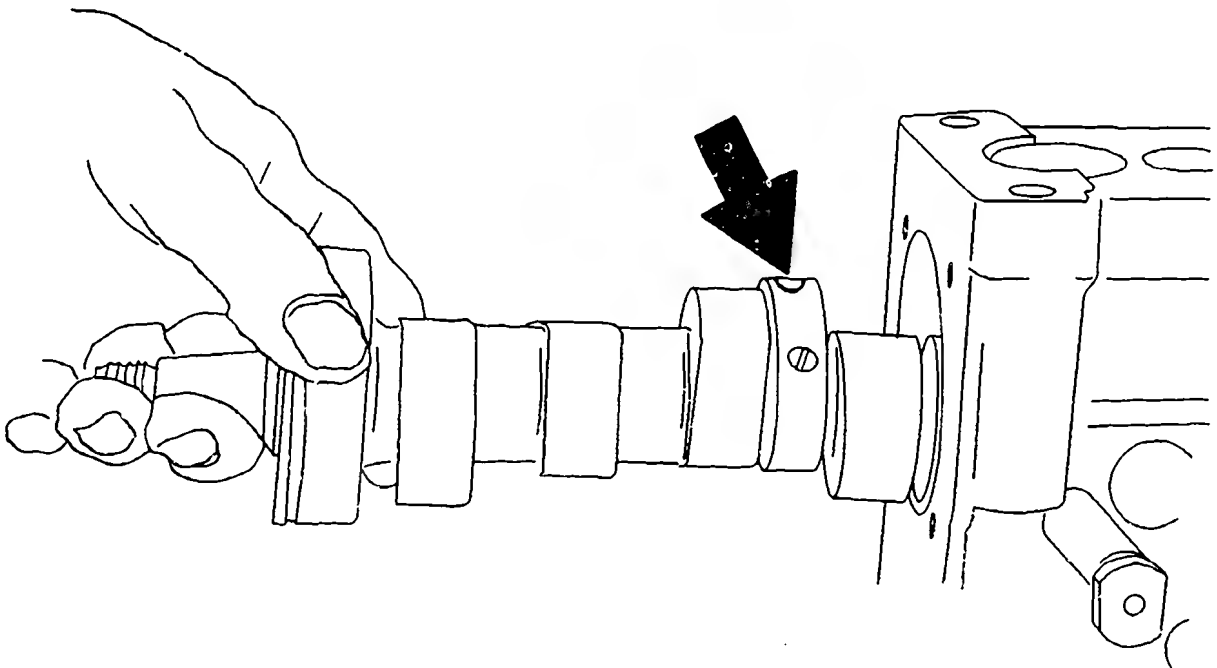
Remove puller 0 986 612 630 from camshaft bearing as soon as this has been extracted from pump housing.

C A R E F U L L Y pull camshaft with bearing and intermediate bearing (arrow) out of pump.

Remove intermediate bearing from camshaft and lay it aside.

Continue: B21/1 Fig.: B20/2

KMK01229

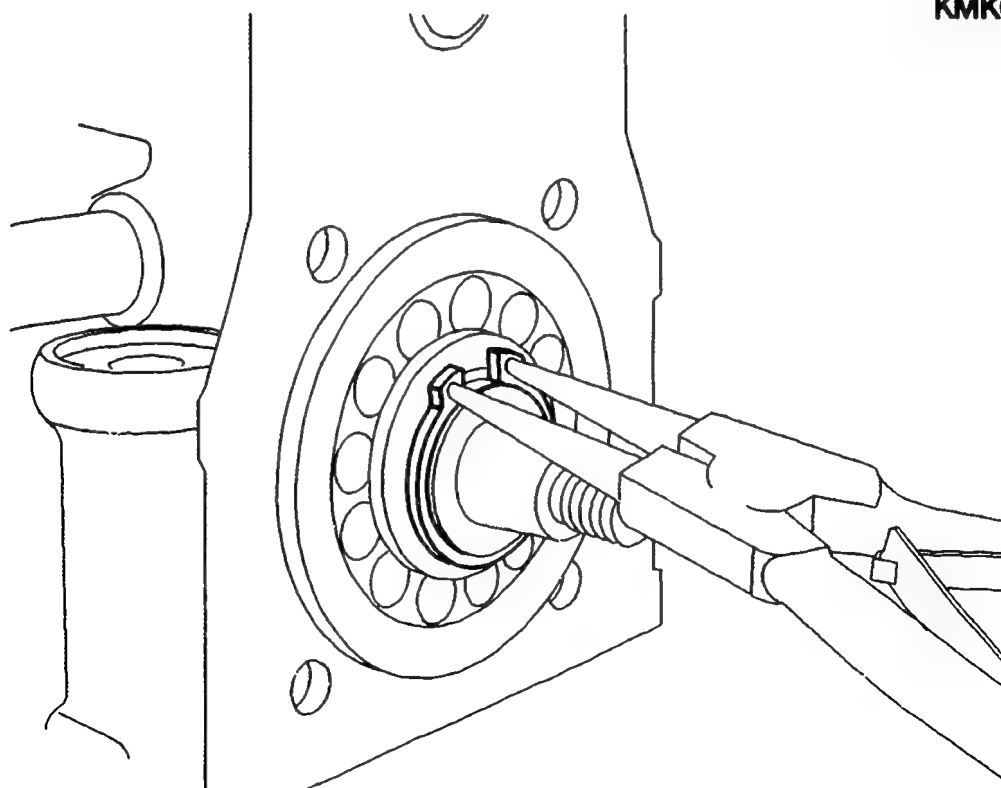


**REMOVAL OF CAMSHAFT
- CYLINDRICAL-ROLLER BEARING**

Remove retaining ring of camshaft bearing from camshaft.

Continue: B22/1 Fig.: B21/2

KMK01231

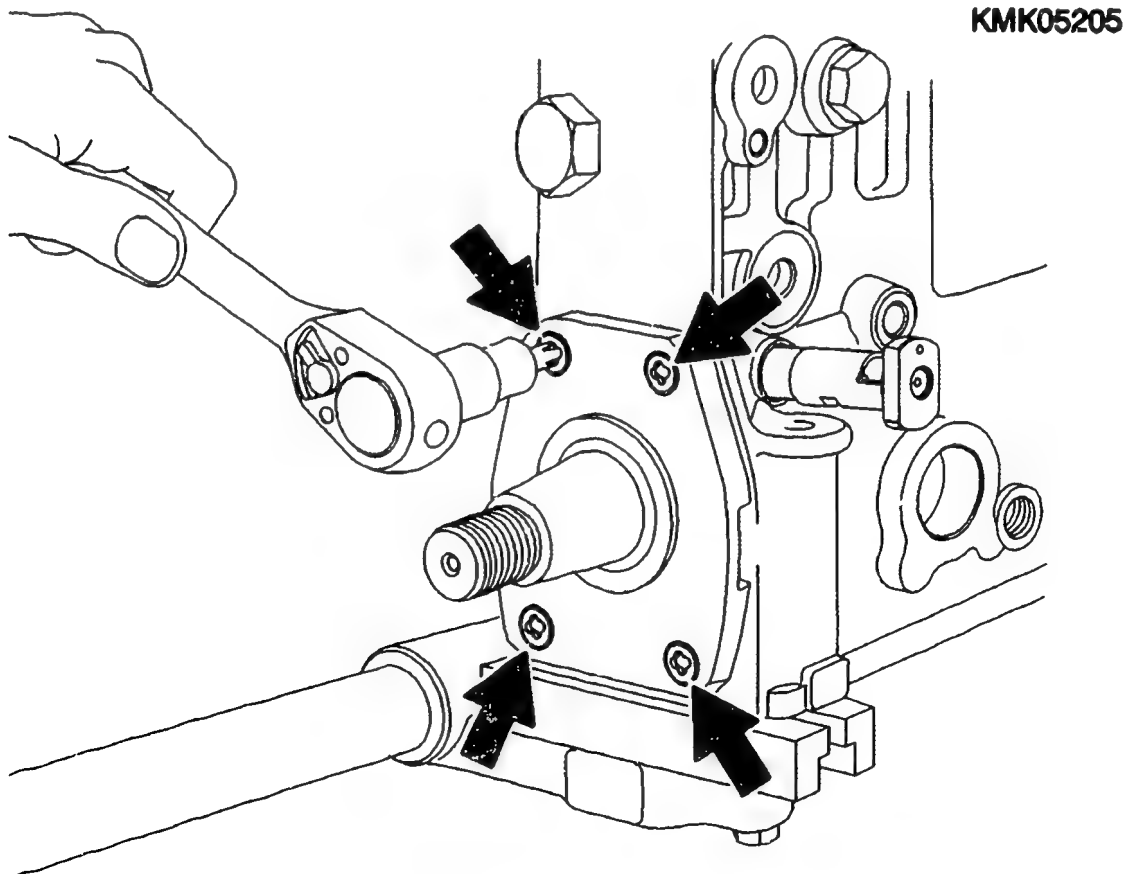


CAMSHAFT REMOVAL - CYLINDRICAL ROLLER BEARING

Loosen and screw out fastening screws
(arrows) of bearing end plate.

Leave bearing end plate in position and
do not remove.

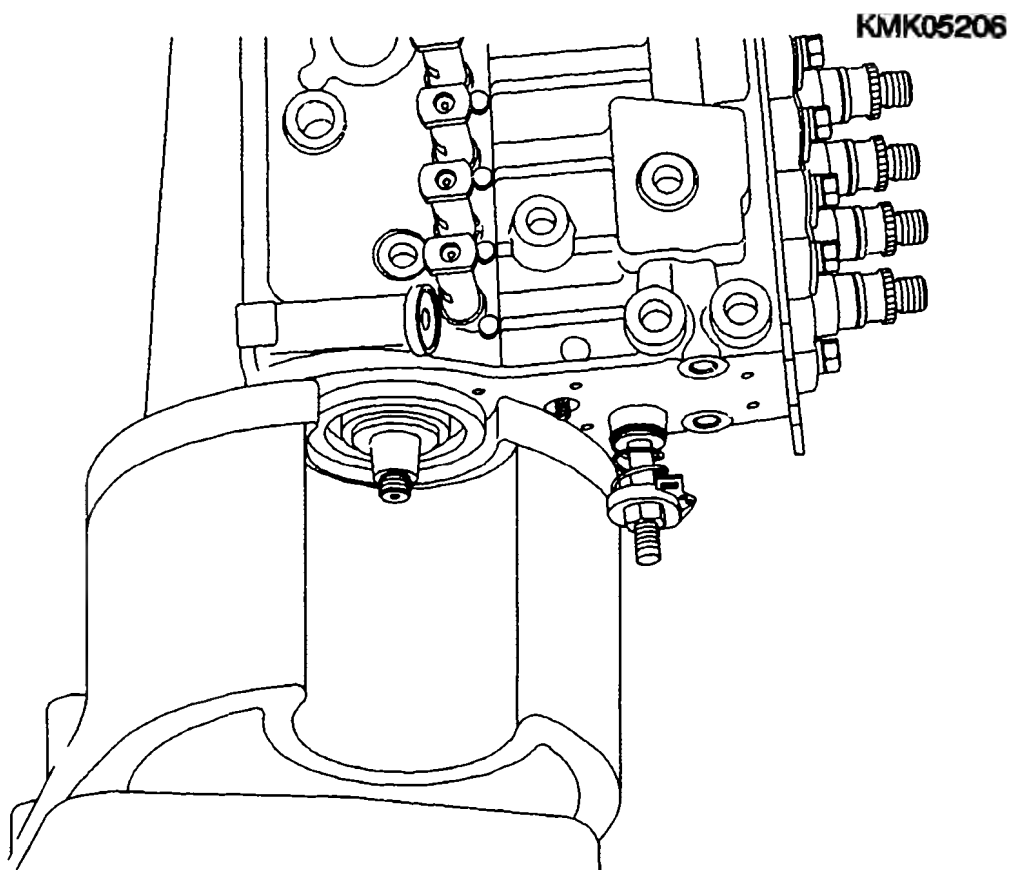
Continue: B23/1 Fig.: B22/2



CAMSHAFT REMOVAL - CYLINDRICAL ROLLER BEARING

Position injection pump with camshaft bearing on governor end facing downwards on screw press (fig.).

Continue: B24/1 Fig.: B23/2



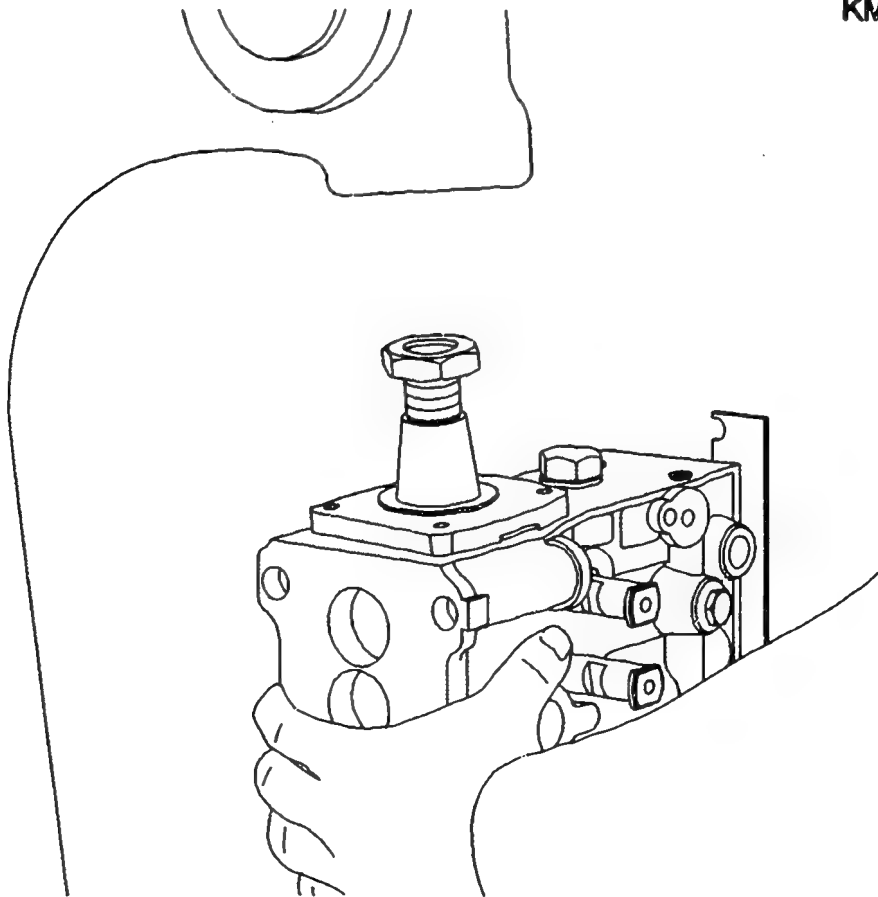
CAMSHAFT REMOVAL - CYLINDRICAL ROLLER BEARING

Screw fastening nut on drive end onto camshaft thread. Roughly two turns of nut must still be visible.

This operation is designed to protect the camshaft thread on pressing out.

Continue: B25/1 Fig.: B24/2

KMK05207



CAMSHAFT REMOVAL - CYLINDRICAL ROLLER BEARING

Note for following operation.

ATTENTION:

Cylindrical roller bearing is split. As soon as bearing emerges from pump housing, outer race slips over rollers. The camshaft also no longer has any hold. It is thus advisable to have a second person guide the camshaft out of the pump housing and at the same time hold the roller bearing in position.

Continue: B26/1

CAMSHAFT REMOVAL - CYLINDRICAL ROLLER BEARING

Press cylindrical roller bearing out of pump housing, exerting uniform pressure on camshaft.

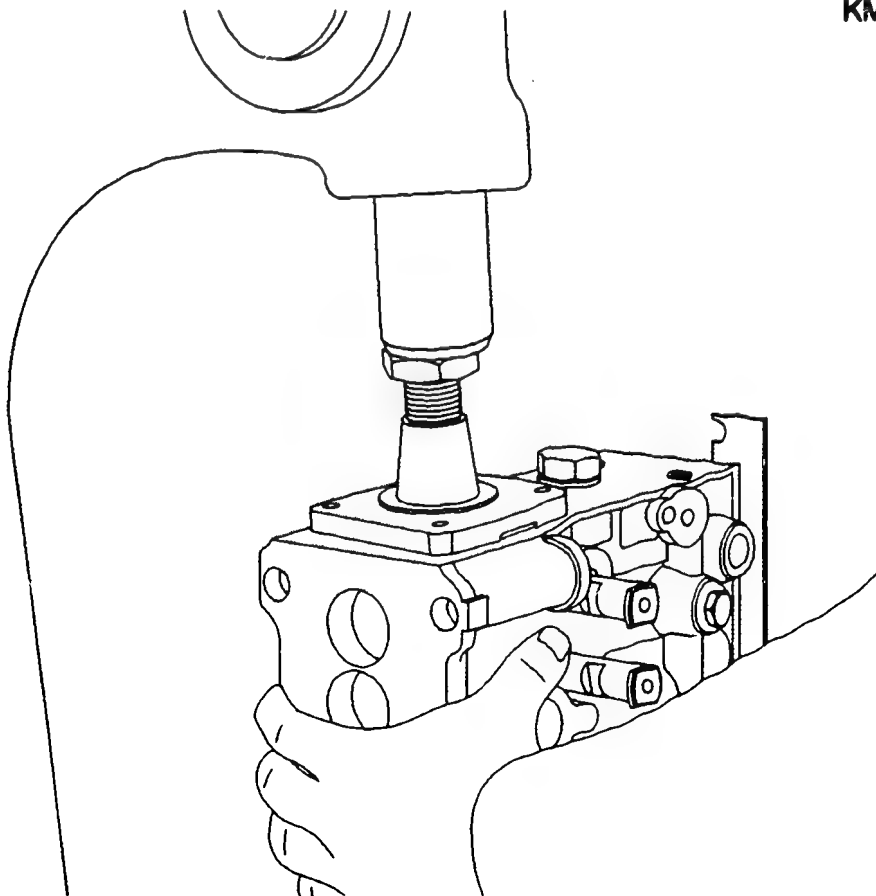
Remove camshaft with intermediate bearing from pump housing and lay it aside.

Note:

The camshaft cannot be removed from the housing until the fastening nut screwed on has been removed again.

Continue: B27/1 Fig.: B26/2

KMK05208



CAMSHAFT REMOVAL - CYLINDRICAL ROLLER BEARING

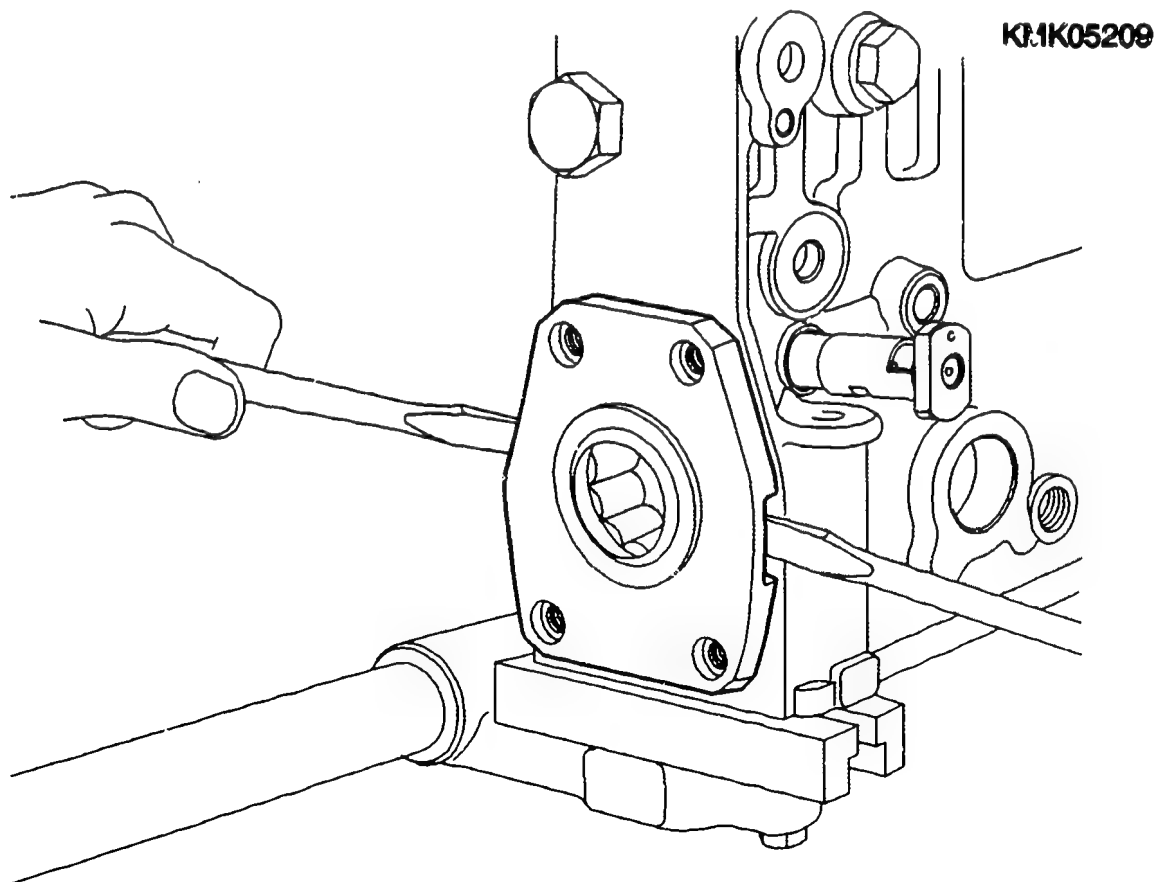
**Mount pump housing on clamping
device again.**

**Carefully remove bearing end plate.
Rollers are loose in outer bearing ring
and may drop out in the event of
sudden movement.**

Note:

**Make sure pump housing is not
damaged when disassembling bearing
end plate.**

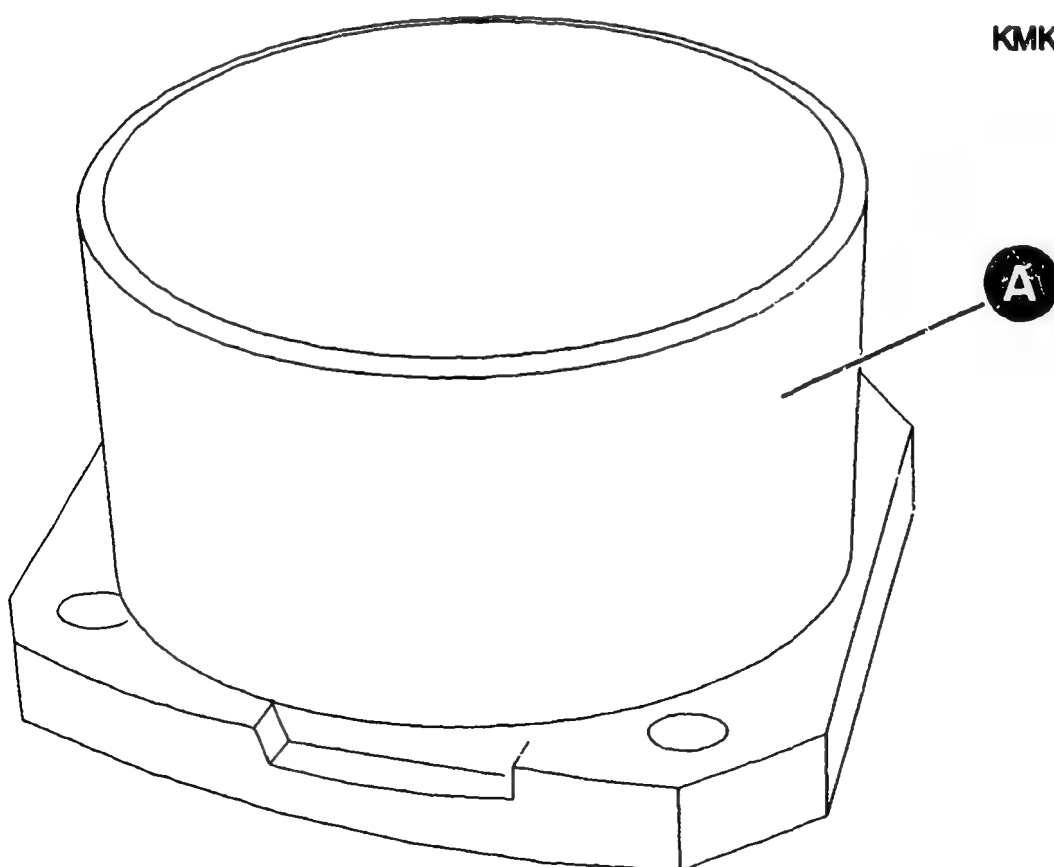
Continue: B28/1 Fig.: B27/2



**CAMSHAFT REMOVAL -
CYLINDRICAL ROLLER BEARING**

**Attach 0 986 612 659 (fig. A) to
bearing end plate removed so as to
prevent loss of bearing rollers.**

Continue: C01/1 Fig.: B28/2



KMK05235

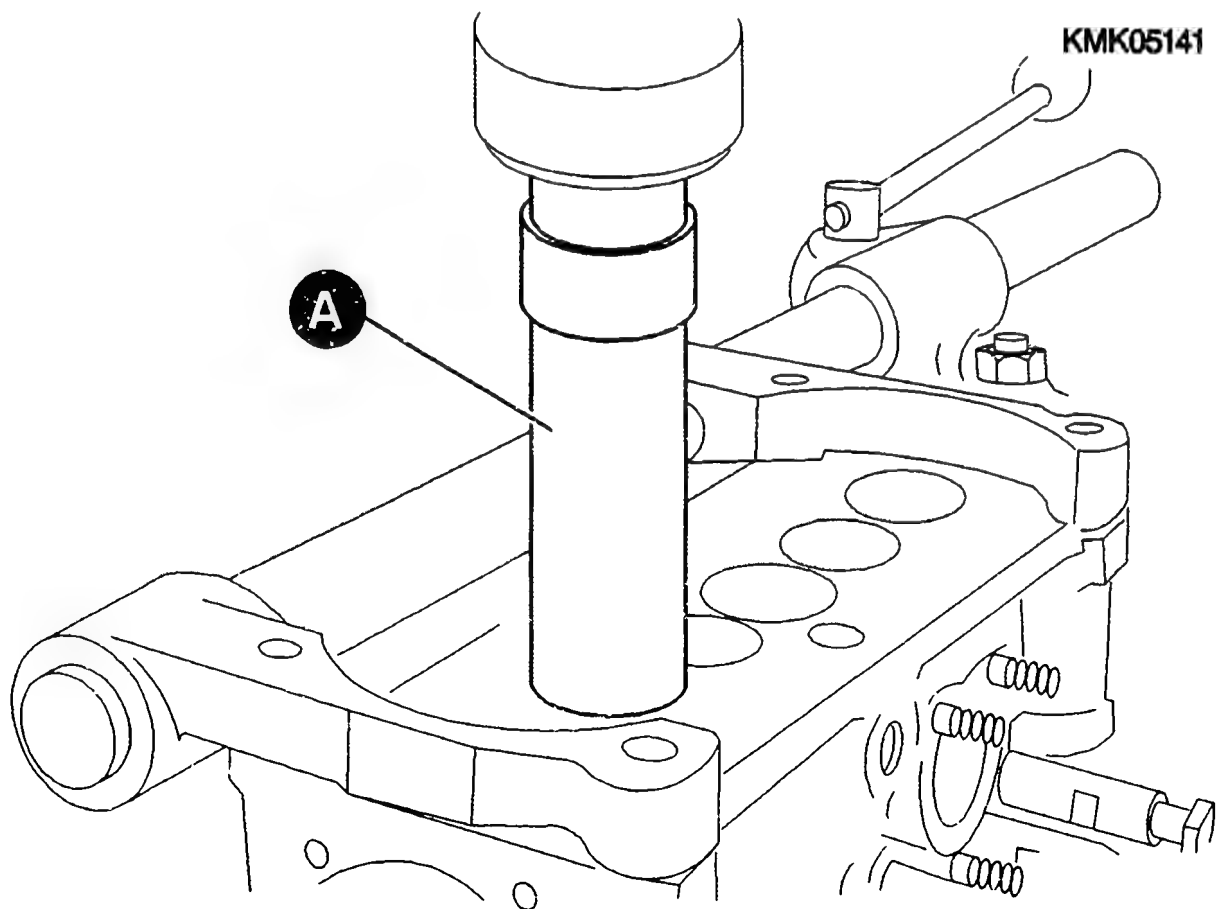
REMOVING BASE COVERS

Use pressing-in mandrel 0 986 612 119 (KDEP 1574 - fig. A) to knock base covers inwards into camshaft chamber of pump housing and remove.

Note:

This operation destroys the base covers and they have to be renewed.

Continue: C02/1 Fig.: C01/2



ROLLER-TAPPET REMOVAL

Safety measure:

The procedure outlined in the Section "ROLLER-TAPPET REMOVAL" must be implemented with extreme caution. When carrying out this operation, there is a possibility of sudden tappet-spring release and thus a DANGER OF INJURY !

Continue: C03/1

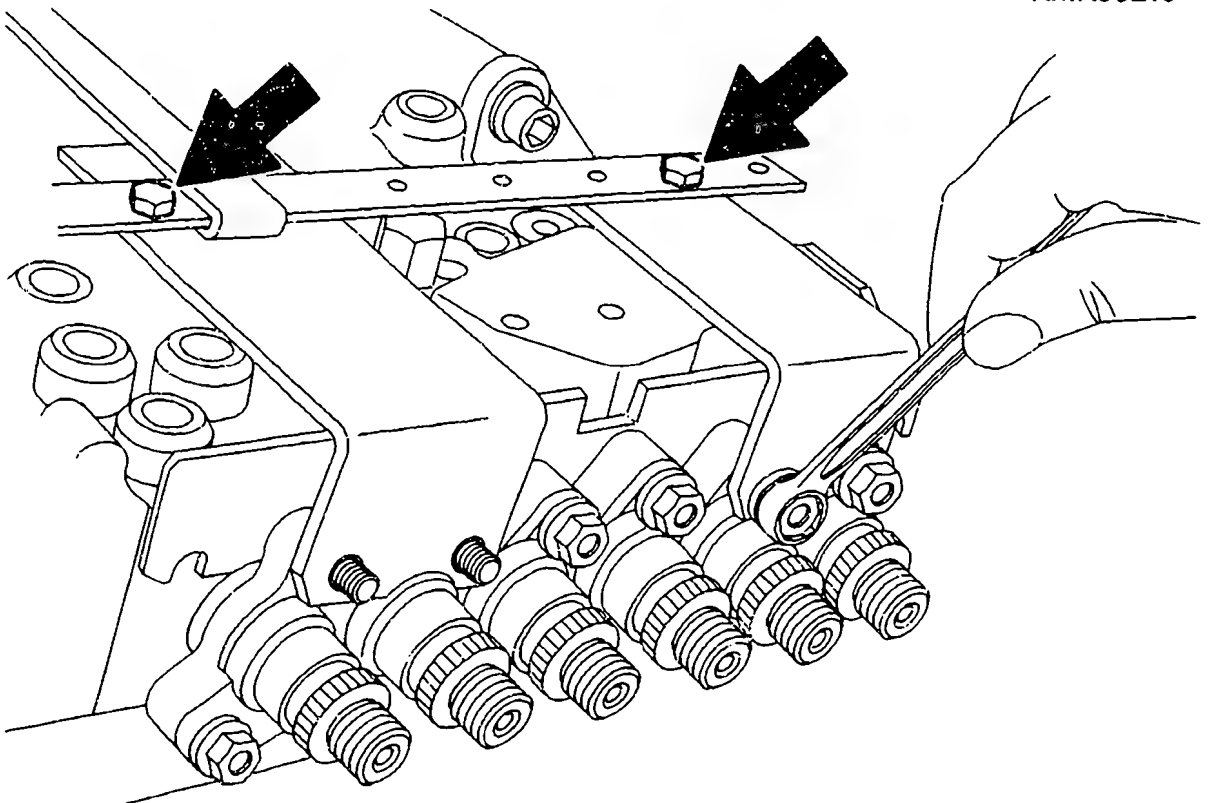
REMOVING ROLLER TAPPETS

Attach assembly tool 0 986 612 072 (KDEP 1556) to angular holders 0 986 612 636 (arrow).

Clamp complete assembly tool fixture with angular holders in position at stud bolts of barrel-and-valve assemblies.

Continue: C04/1 Fig.: C03/2

KMK05210

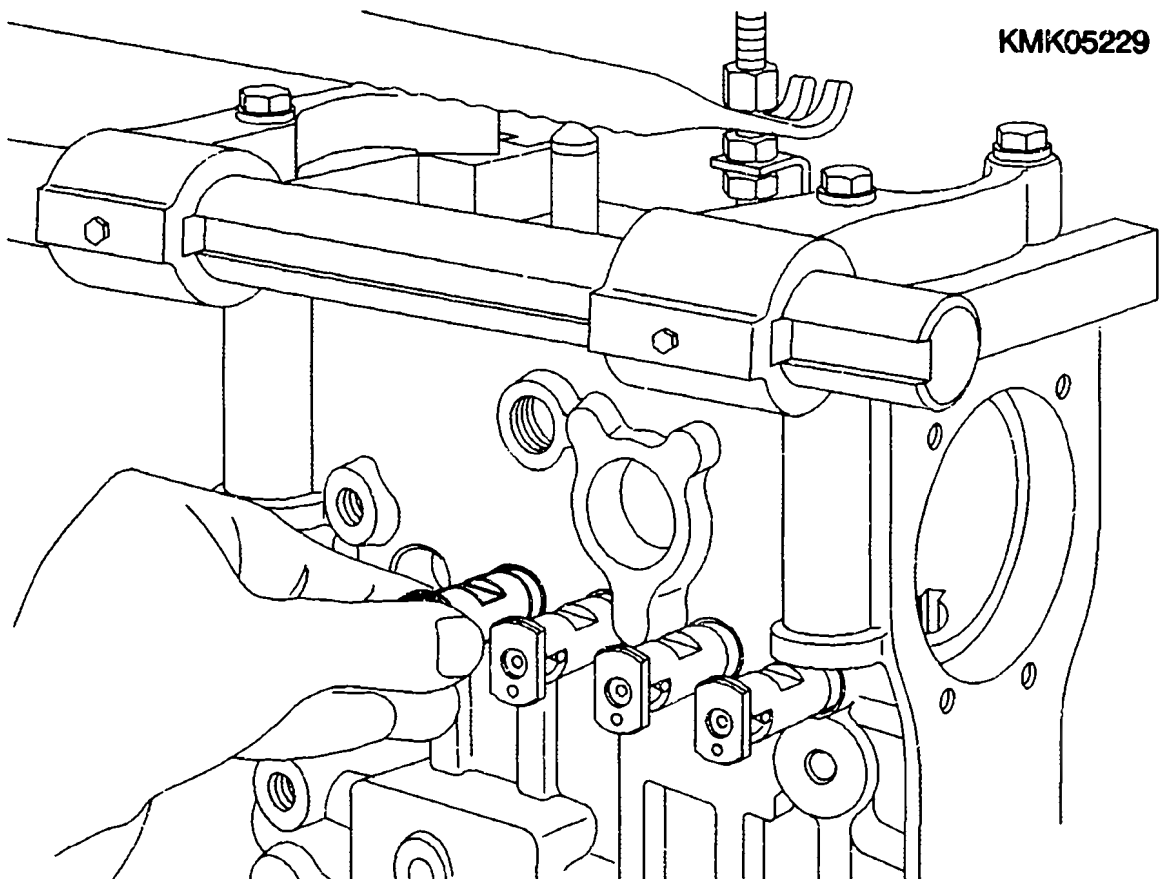


CAMSHAFT REMOVAL - SELF-ALIGNING ROLLER BEARING

Insert puller screw with nut through center bore in bell end of puller 0 986 612 630 and screw into support plate of inner collet. Check position through inspection hole in bell end (arrow).

To pull out bearing with camshaft, hold screw with open-end wrench and turn nut (1) with second wrench.

Continue: C05/1 Fig.: C04/2



REMOVING ROLLER TAPPETS

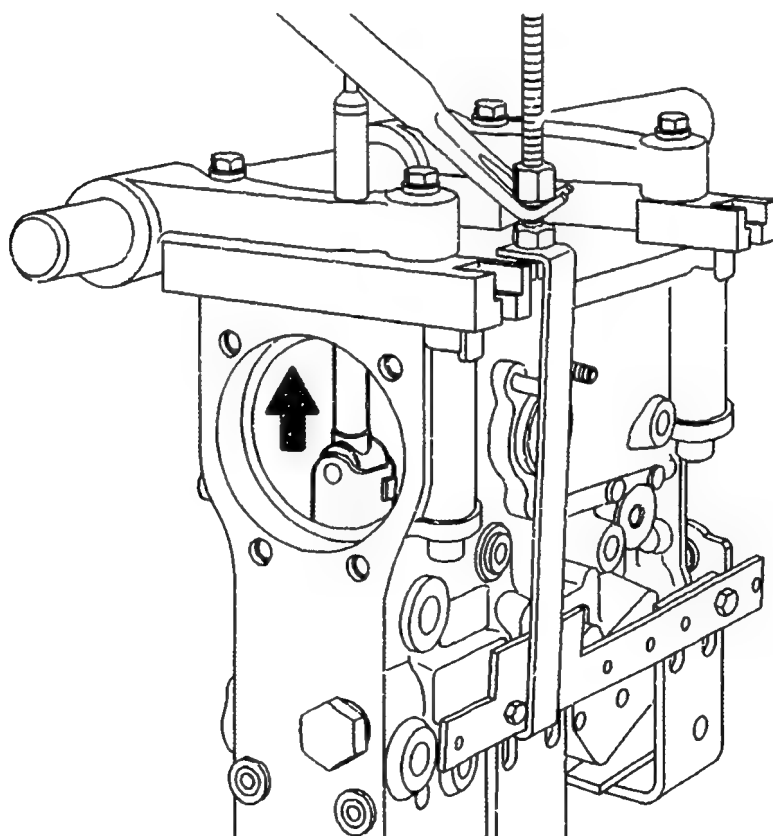
Carefully move tubular lever of assembly tool upwards again and thus relieve tension on plunger return spring.

This procedure is to be repeated for every pump tappet.

Remove assembly tool 0 986 612 072 (KDEP 1556) again.

Screw washer and fastening nut back onto stud bolts and secure.

Continue: C06/1 Fig.: C05/2



KMK05212

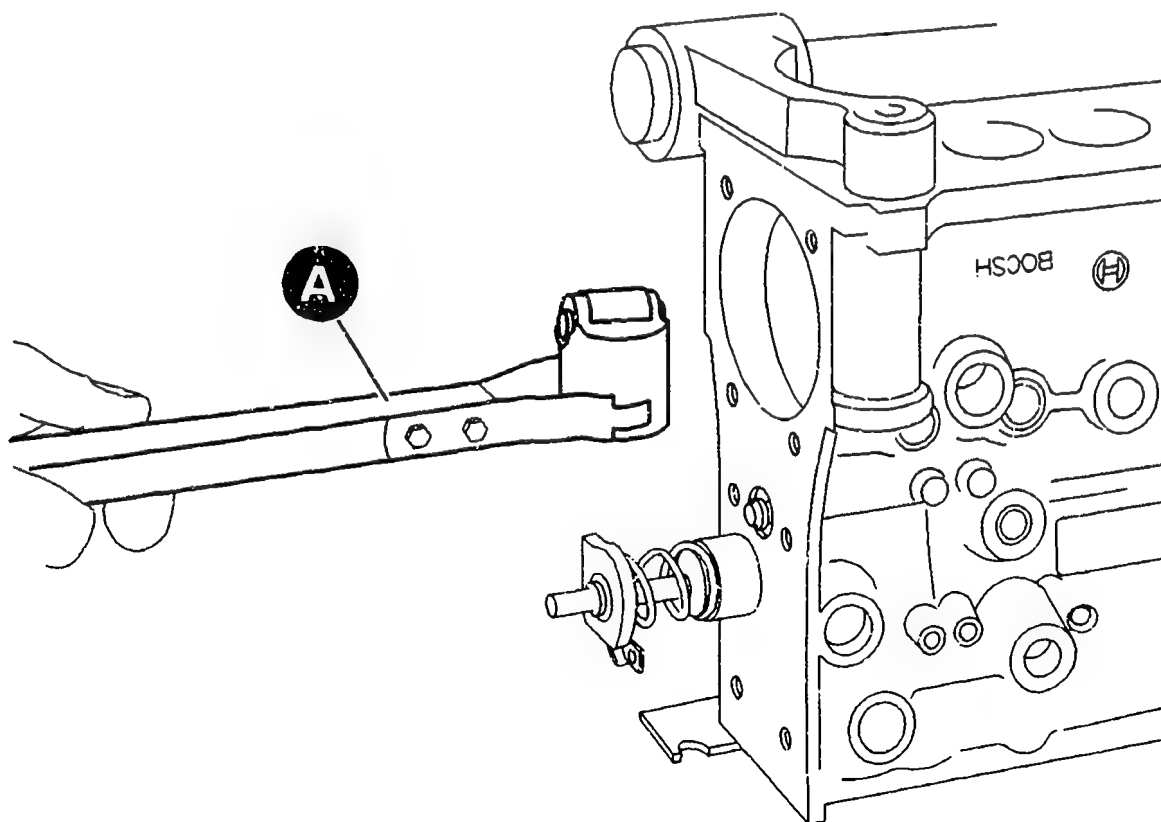
REMOVING ROLLER TAPPETS

Remove roller tappet with 0 986 611 298 (KDEP 2941, fig. - A).

Repeat procedure with each pump barrel.

Continue: C07/1 Fig.: C06/2

KMK05142



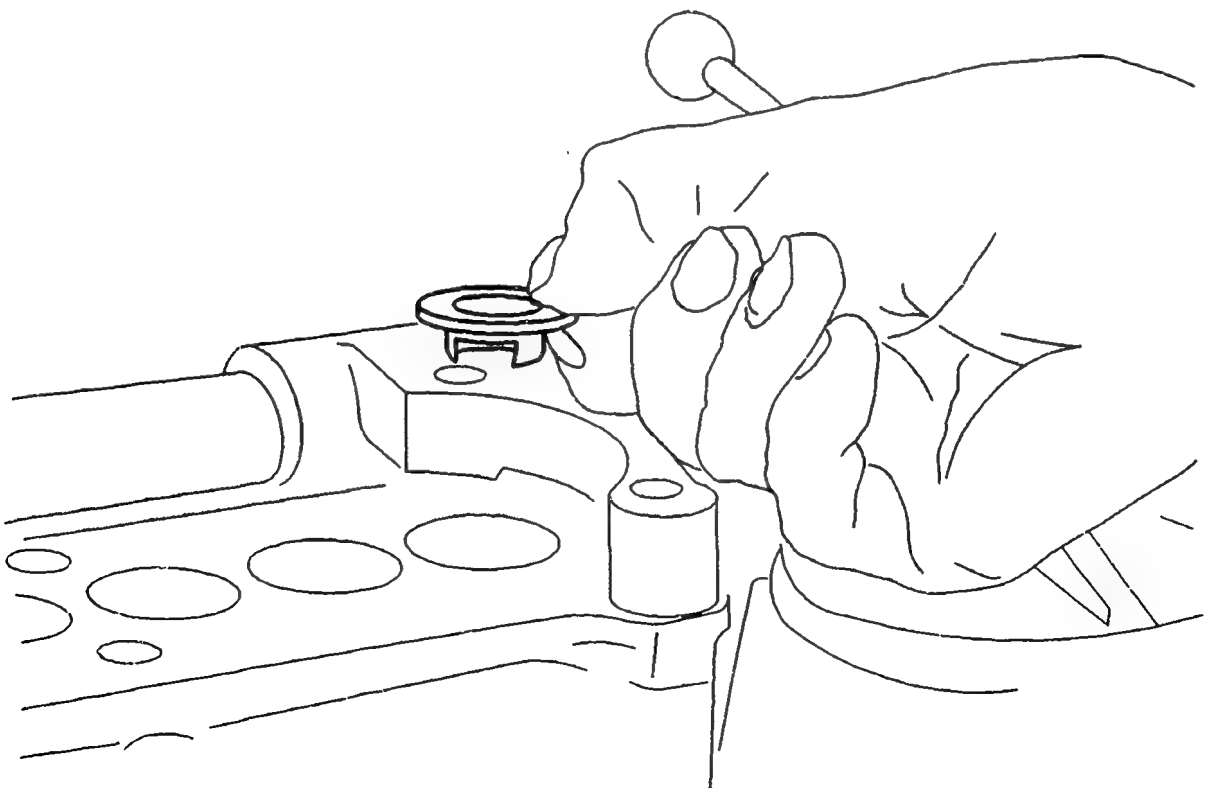
REMOVING LOWER SPRING SEAT

Remove lower spring seat.

This procedure is to be repeated for each pump barrel.

Continue: C08/1 Fig.: C07/2

KMK01241



REMOVING PUMP PLUNGER

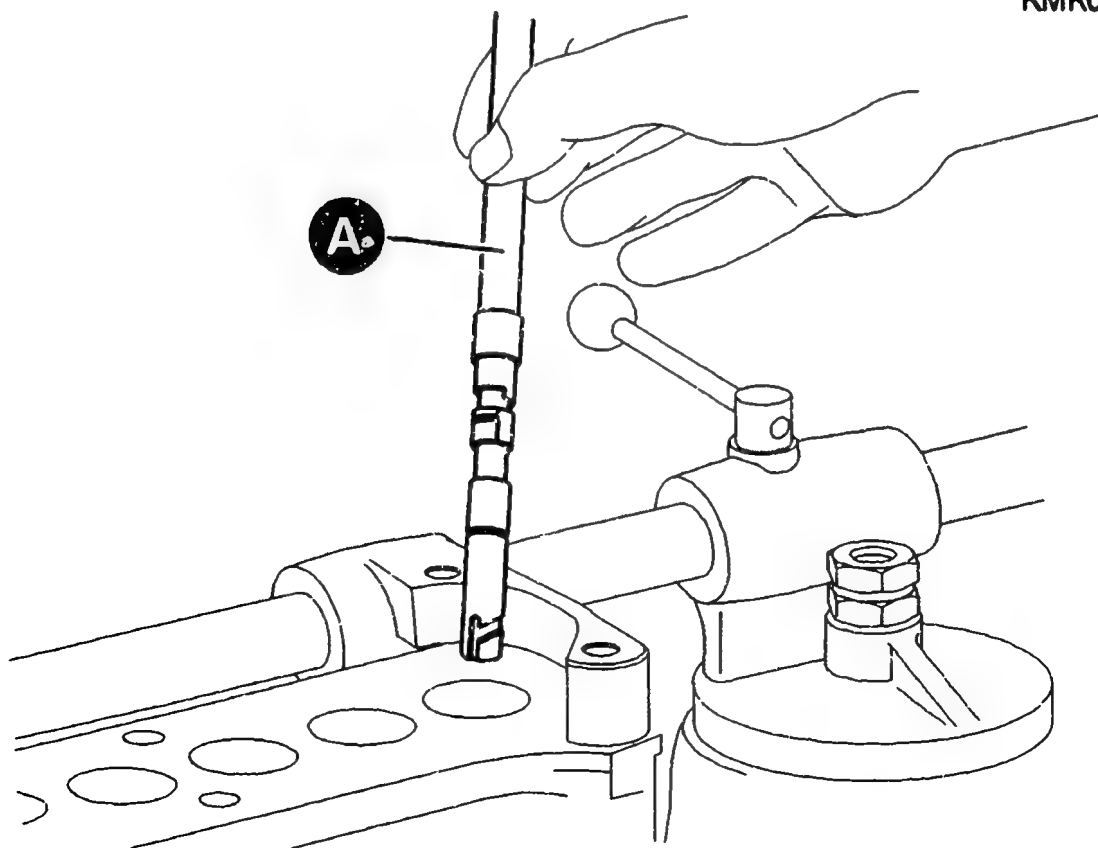
Use pliers 0 986 612 120 (KDEP 1575 - fig. A) to pull pump plunger out of pump barrel and set aside.

CAUTION:

Pump plungers are not to be interchanged, i.e. all parts belonging to a given barrel must be kept together.

Continue: C09/1 Fig.: C08/2

KMK05143



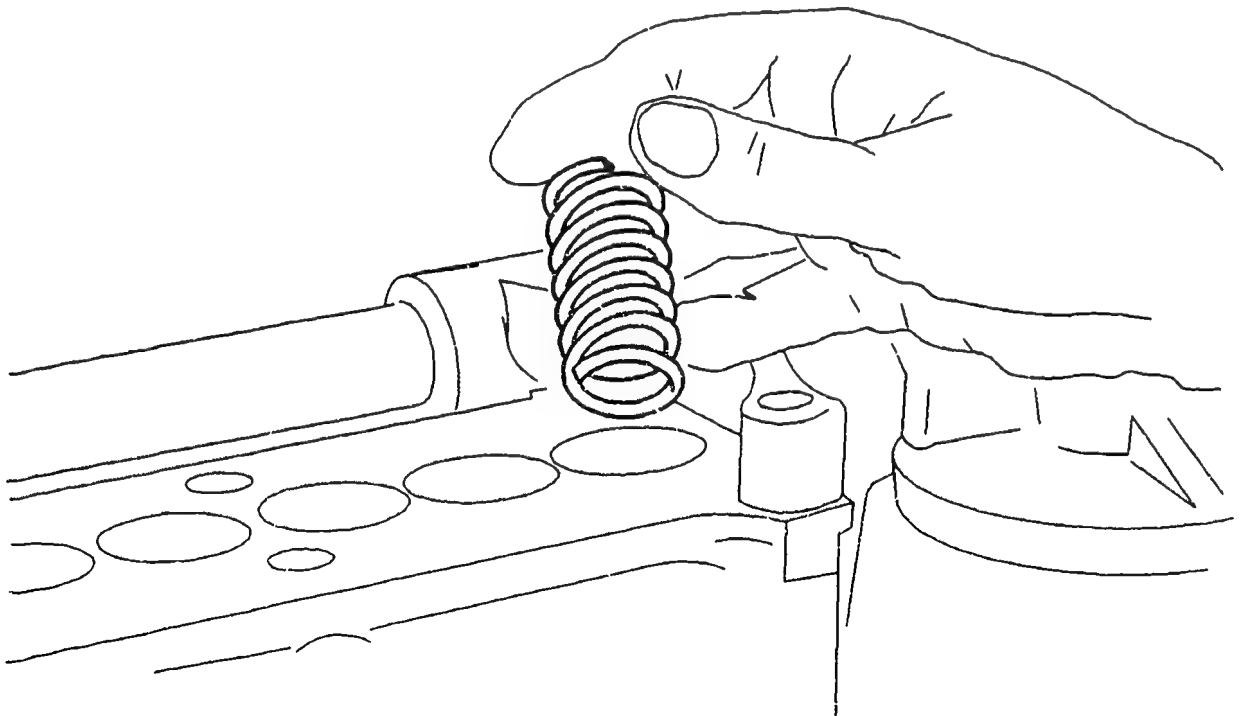
REMOVING TAPPET SPRING

Remove tappet spring.

This procedure is to be repeated for each pump barrel.

Continue: C10/1 Fig.: C09/2

KMK01243



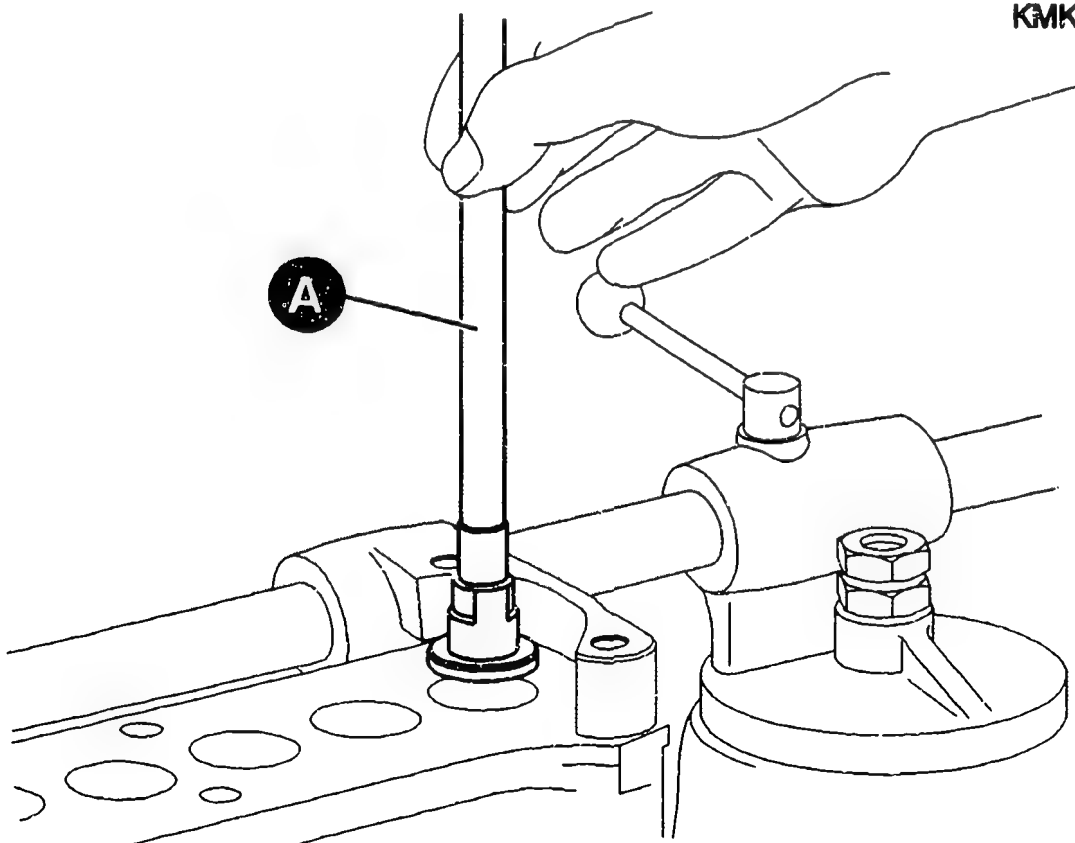
REMOVING CONTROL SLEEVE AND SPRING PLATE

Use wrench 0 986 611 738 (KDEP 1071 - fig. A) to remove control sleeve and upper spring plate.

In doing so, control rod must be in center position.

Repeat procedure for each pump barrel.

Continue: C11/1 Fig.: C10/2



DISASSEMBLING ROLLER TAPPET

Knock roller pin out of roller tappet housing with punch (e.g. aluminium, brass).

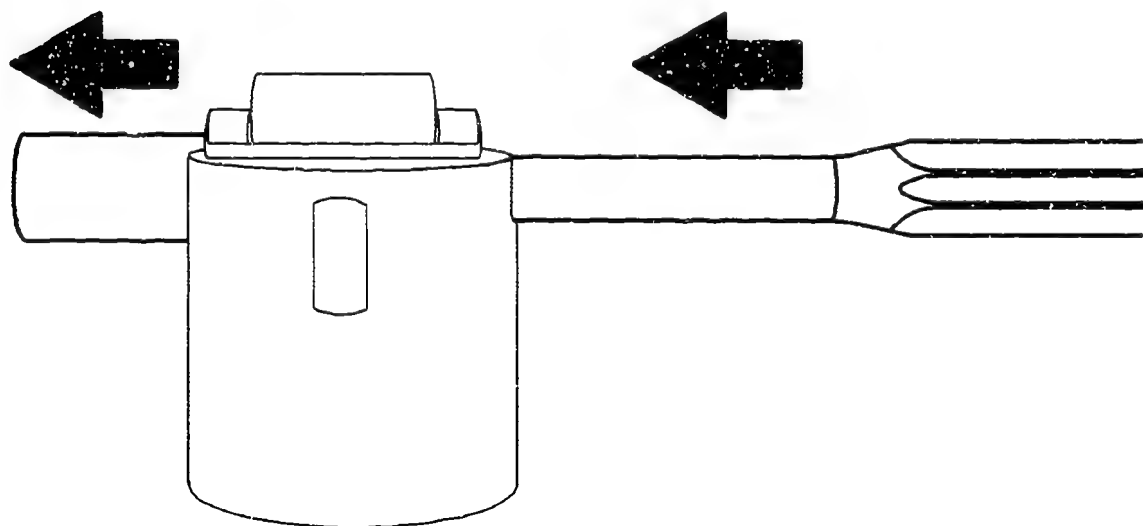
Note:

Position punch on secured side of roller pin.

Scrap retainer following disassembly.

Continue: C12/1 Fig.: C11/2

KMK03650

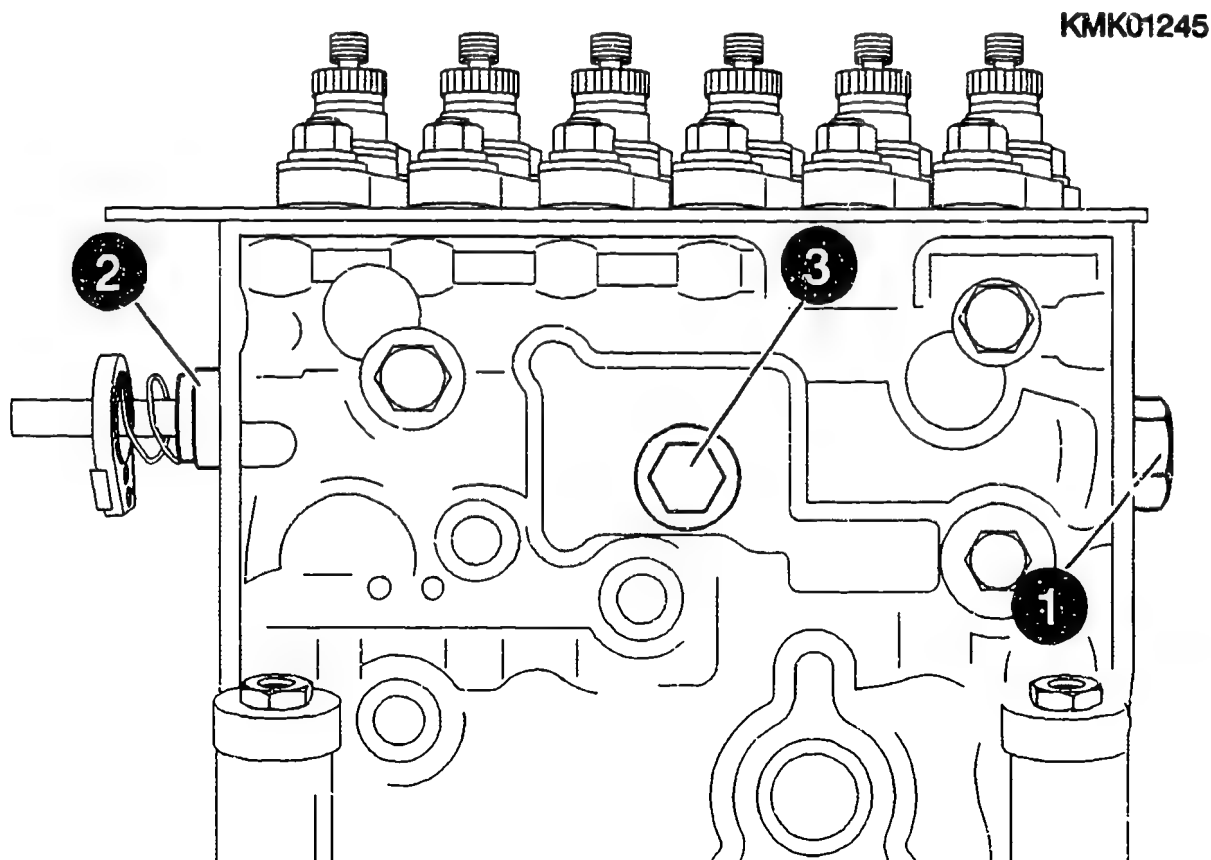


REMOVING CONTROL ROD (RE-POSITIONER)

Unscrew control-rod screw plug (1).

Loosen and unscrew cap nut and lock nut (3) of control-rod guide screw.

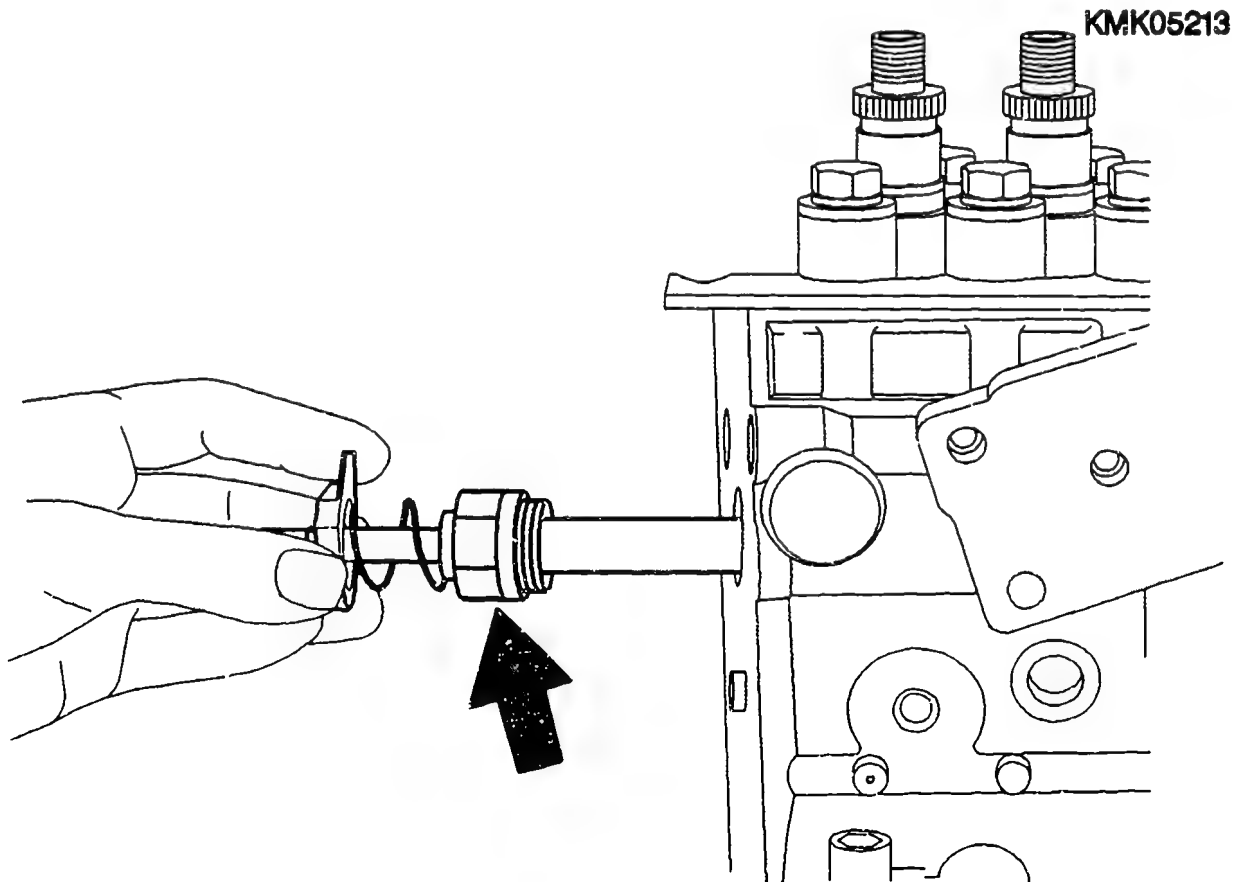
Continue: C13/1 Fig.: C12/2



REMOVING CONTROL ROD (RE-POSITIONER)

Loosen control-rod nut (arrow) and pull control rod out of pump on governor end.

Continue: C14/1 Fig.: C13/2



REMOVING CONTROL ROD (RE-POSITIONER)

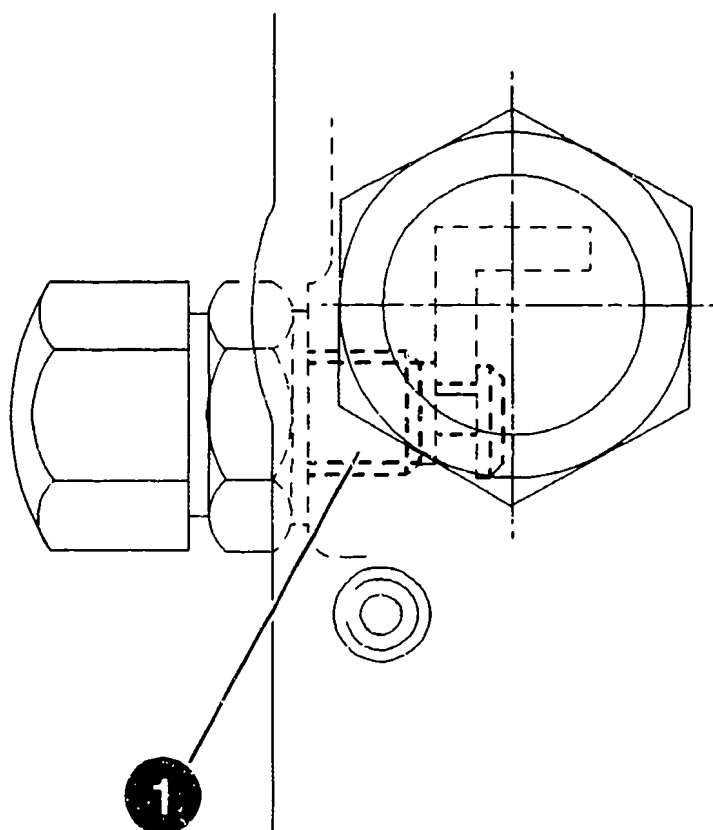
Screw out control-rod guide screw (1).

Note:

The control-rod guide screw cannot be screwed out **U N T I L** the control rod has been removed.

Continue: C15/1 Fig.: C14/2

KMK01246



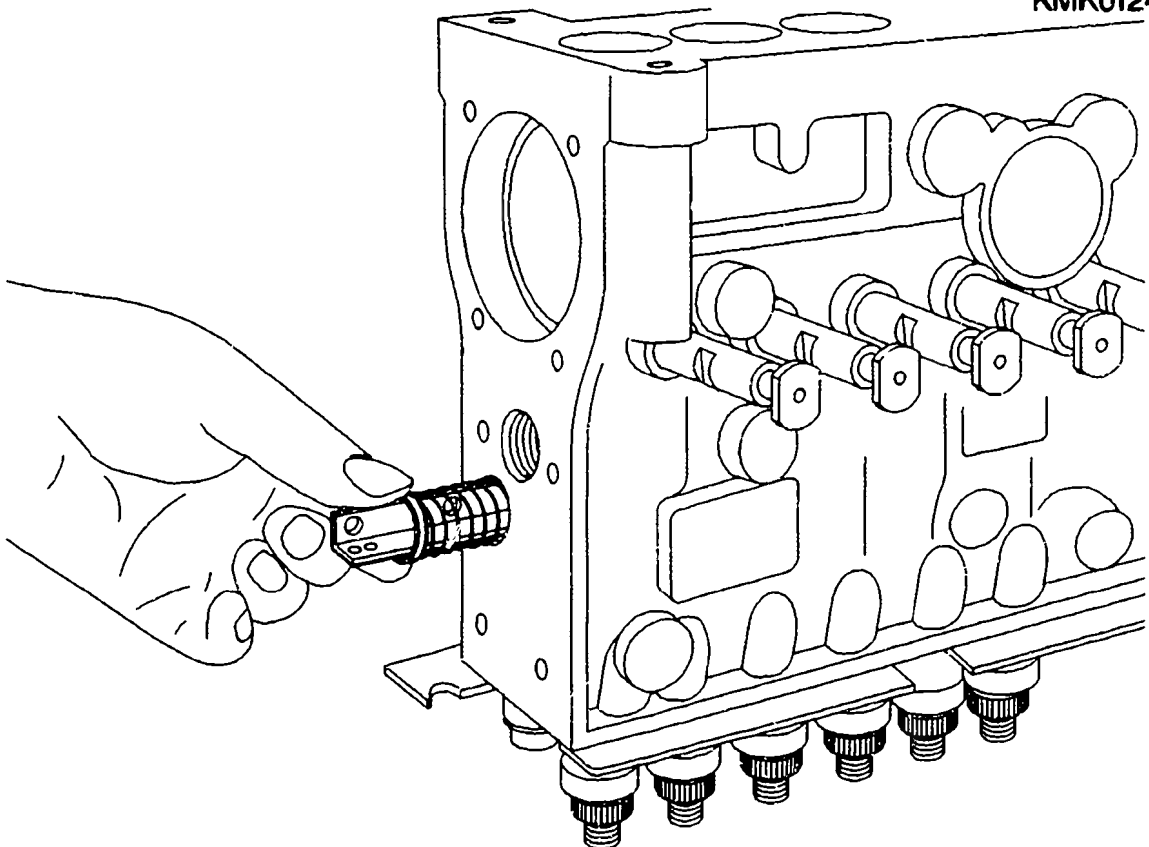
REMOVING CONTROL ROD (MECH. GOVERNOR)

Screw connecting link off control rod.

Remove spring plate and play compensating spring from control rod on governor end (fig.).

Continue: C16/1 Fig.: C15/2

KMK01248



REMOVING CONTROL ROD (MECHANICAL GOVERNOR)

Remove (picture a) threaded ring with pin-type socket wrench 0 986 612 129 (KDEP 1577).

Remove positioning pin (picture b - arrow).

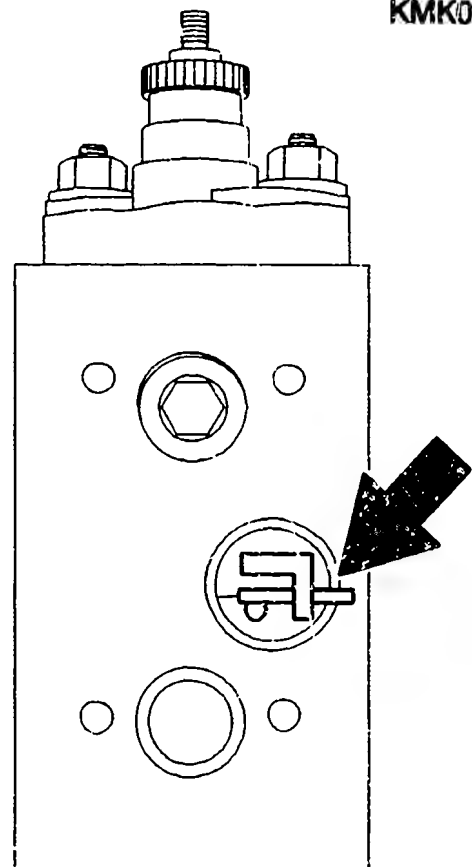
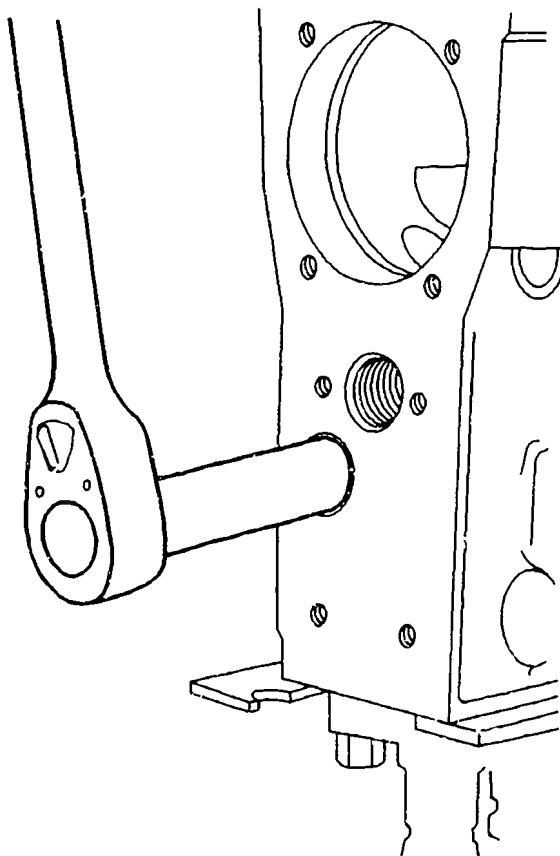
Pull out control rod away from drive end.

Remove control-rod screw plug on drive end and take out guide.

Note:

If guide bushing sticks, push it out away from drive end with long mandrel.

Continue: C17/1 Fig.: C16/2



KMK01249

REMOVING CONTROL ROD (RE-POSITIONER)

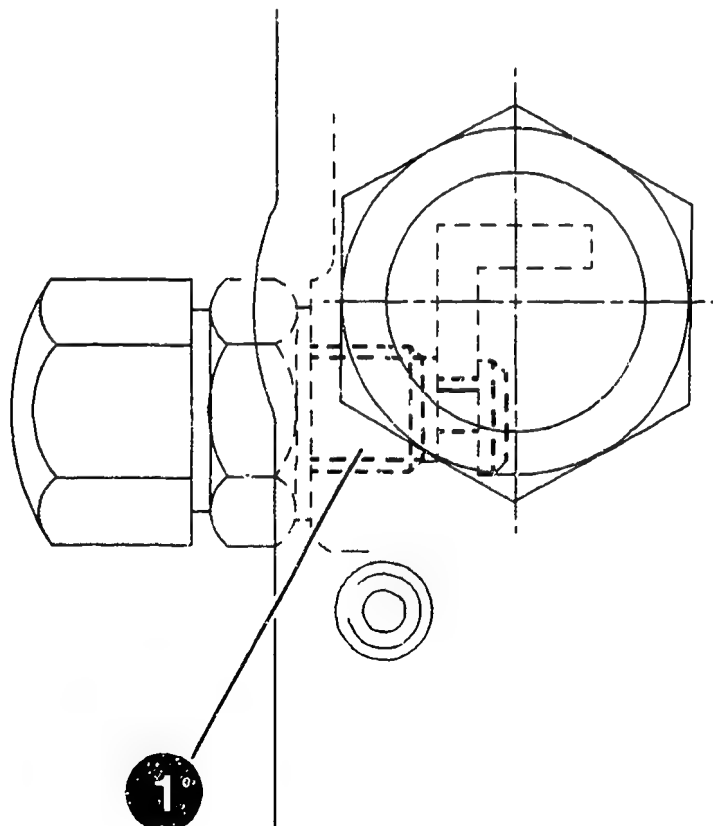
Screw out control-rod guide screw (1).

Note:

The control-rod guide screw cannot be screwed out U N T I L the control rod has been removed.

Continue: C18/1 Fig.: C17/2

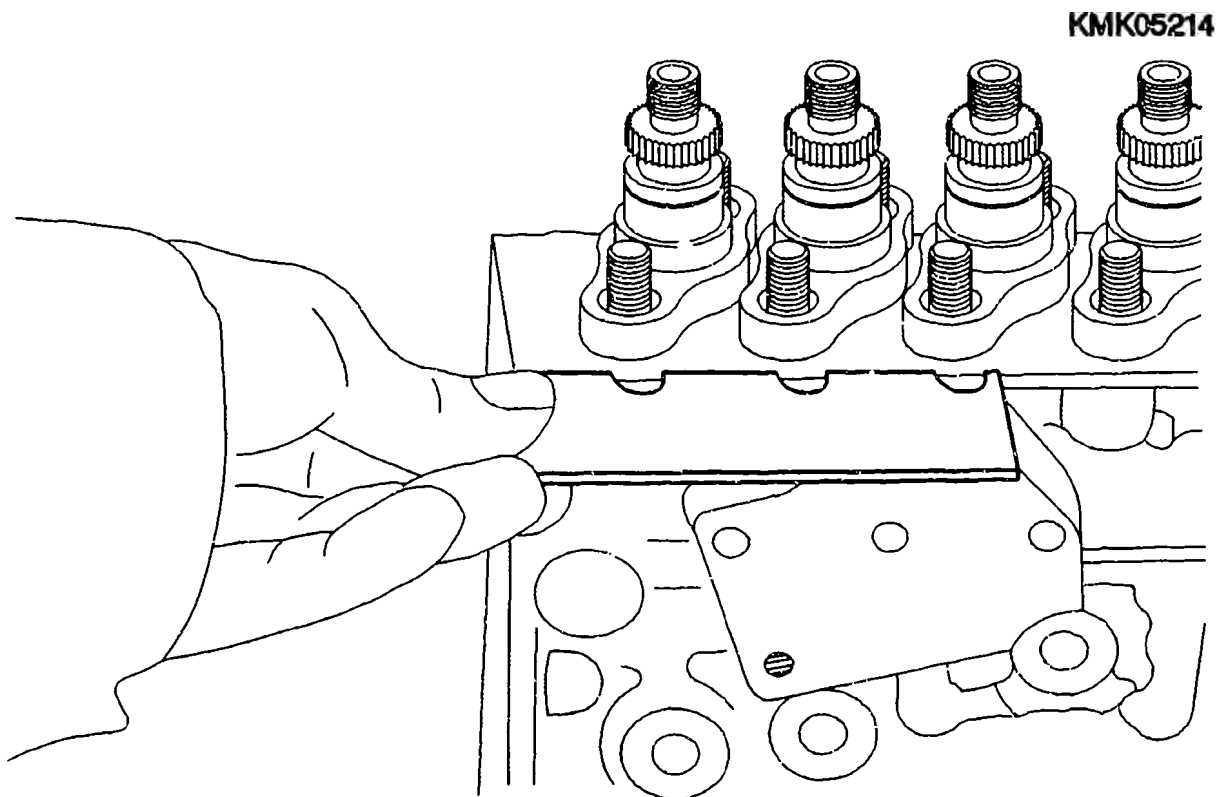
KMK01246



REMOVING BARREL-AND-FLANGE ELEMENT

Unscrew hexagon nuts of barrel-and-flange elements and pull out/set aside spacer plates 0 986 612 061 (KDEP 1550) beneath flanges.

Continue: C19/1 Fig.: C18/2



REMOVING BARREL-AND-FLANGE ELEMENT

Use puller 0 986 612 397 (KDEP 1763) to remove barrel-and-valve assemblies from pump housing.

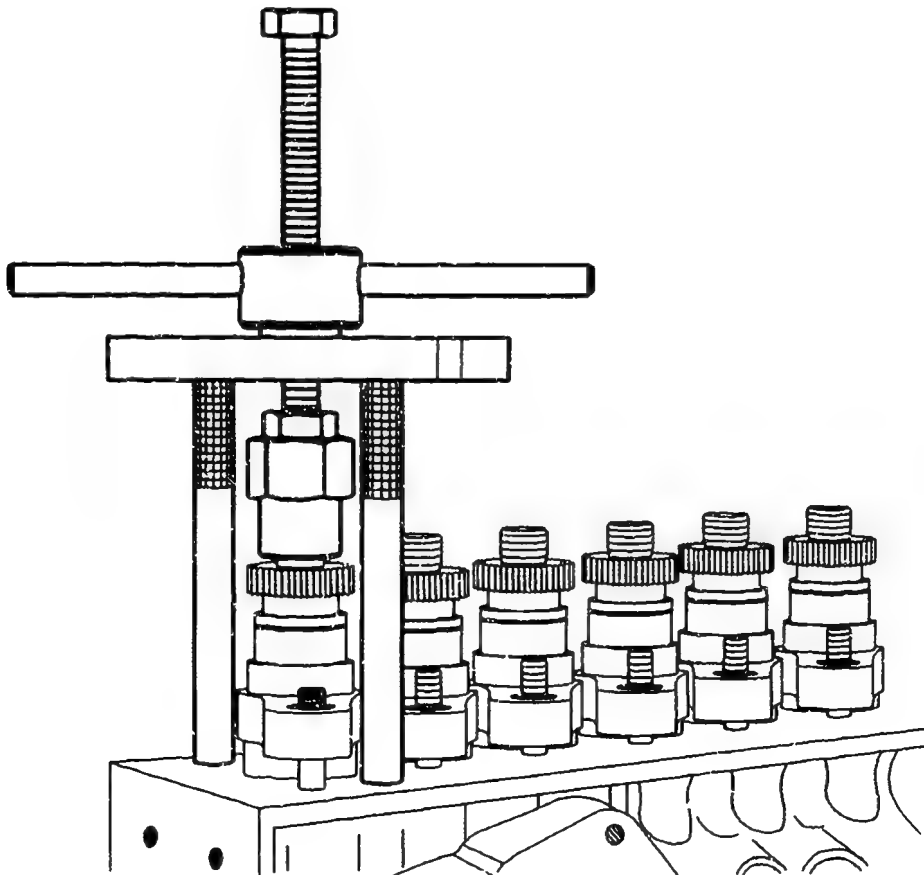
Note :

When setting down barrel-and-valve assemblies, maintain same sequence as for pump plunger removal.

Delivery-valve holder, pump plunger and pump barrels contained in barrel-and-valve assembly must not be interchanged.

Continue: C20/1 Fig.: C19/2

KMK05215

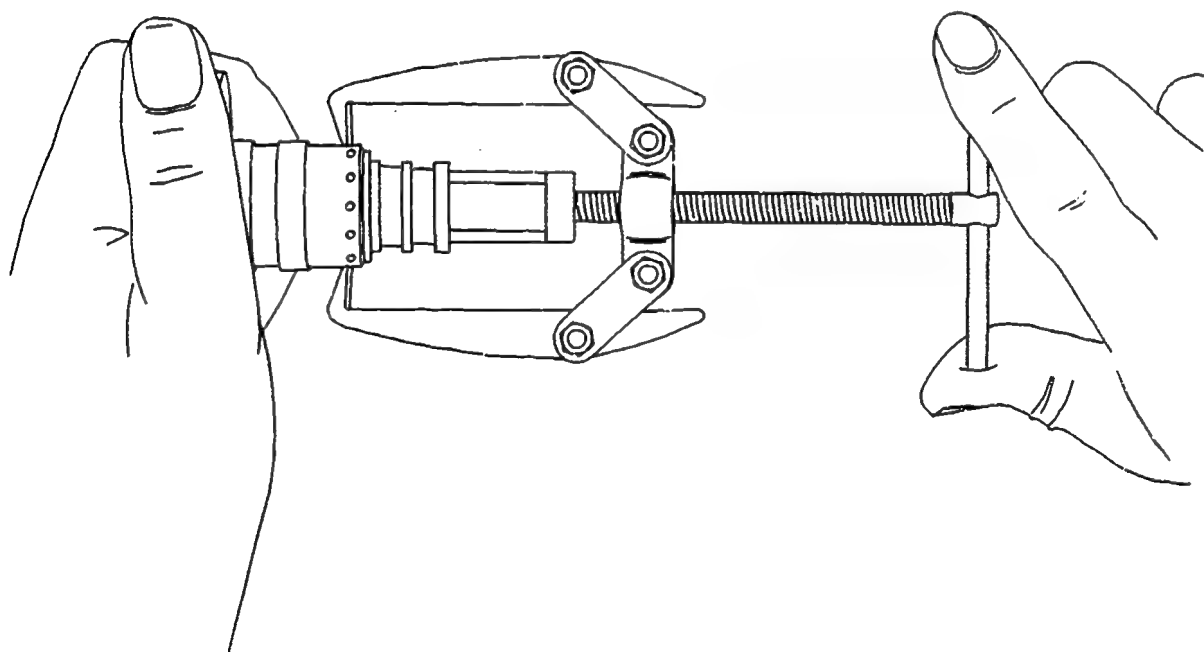


DISASSEMBLING BARREL-AND-FLANGE ELEMENT

Insert pins of puller 0 986 612 498 in opposing holes in impact cap and remove impact cap and retainer from element by turning spindle.

Continue: C21/1 Fig.: C20/2

KMK03651



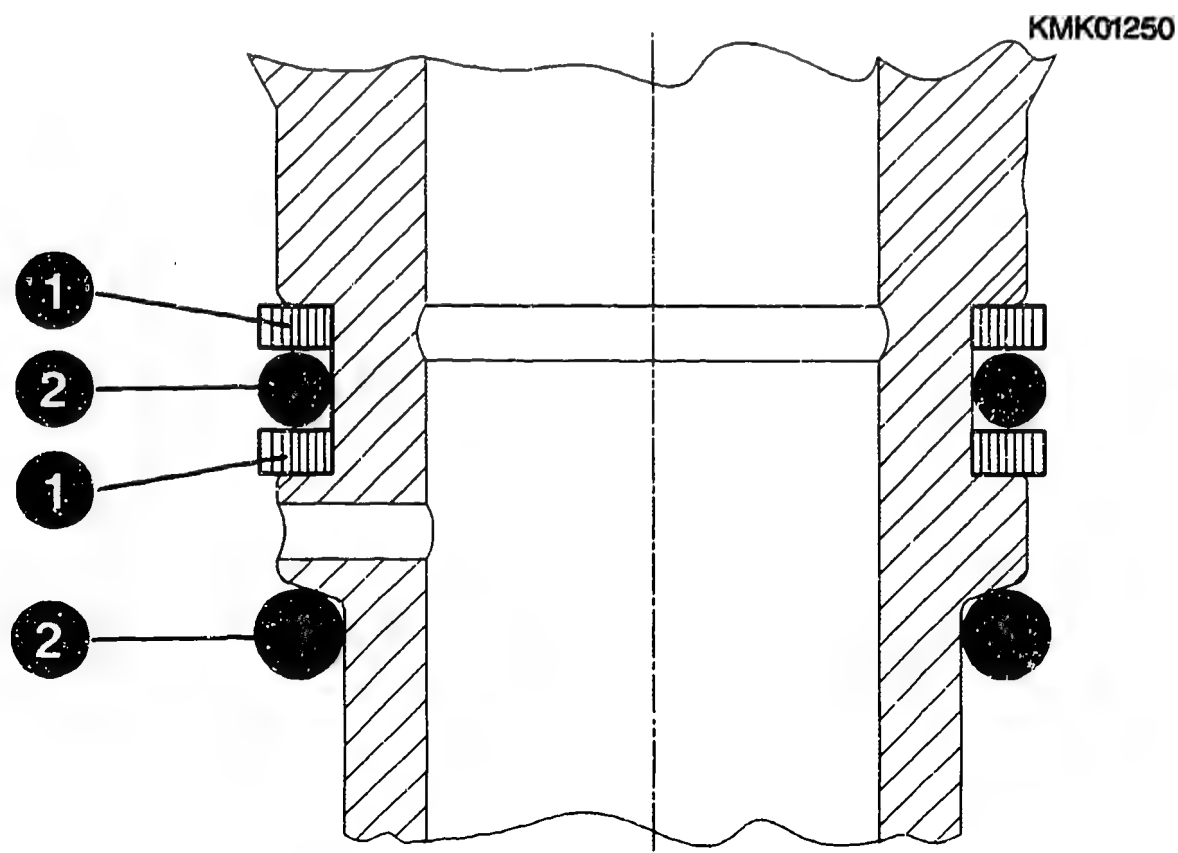
DISASSEMBLING BARREL-AND-FLANGE ELEMENT

Remove support rings (1) and take off O-rings (2).

Note:

Retainer, support rings and O-rings are to be renewed.

Continue: C22/1 Fig.: C21/2

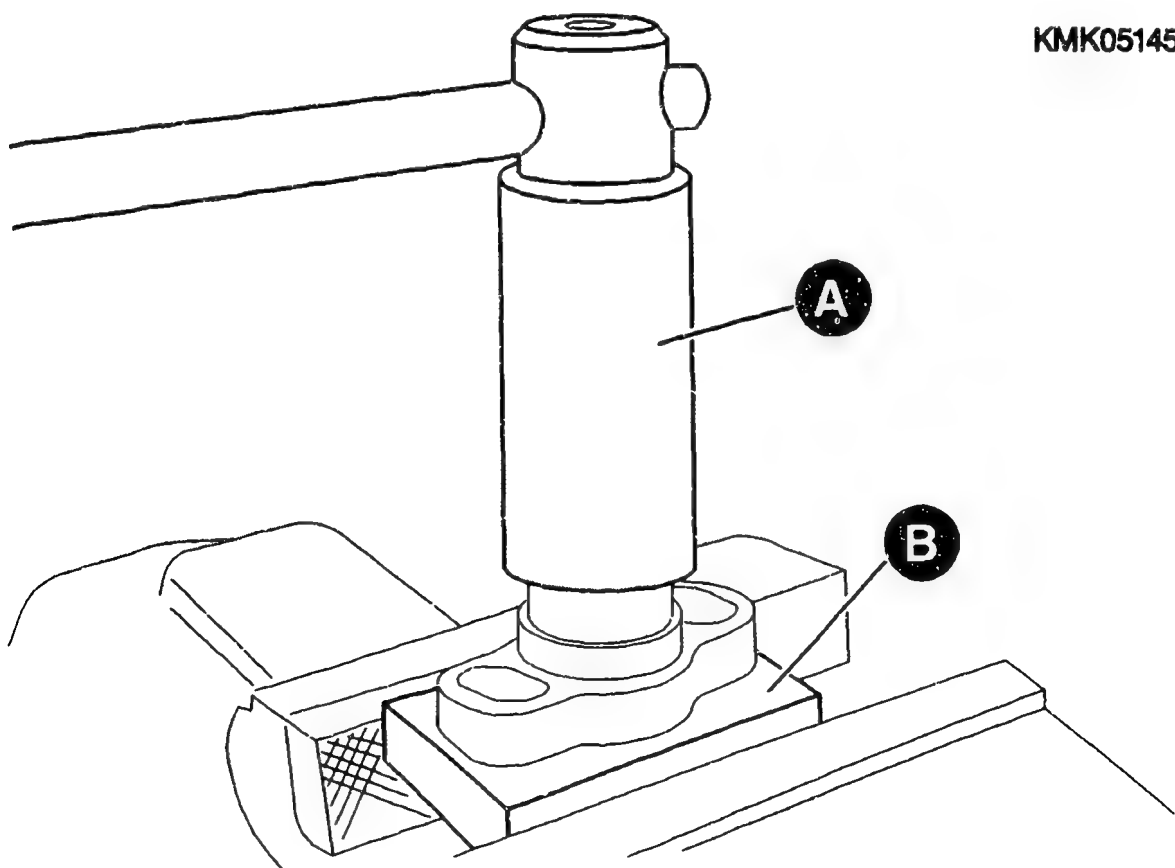


DISASSEMBLING BARREL-AND-FLANGE ELEMENT

Place barrel-and-valve assembly in
assembly tool 0 986 611 356
(KDEP 2962 - fig. B).

Loosen delivery-valve holder with
socket wrench 0 986 611 451 (KDEP 2986
- fig. A) and screw out.

Continue: C23/1 Fig.: C22/2



DISASSEMBLING BARREL-AND-FLANGE ELEMENT

Remove valve spring with spring plate or filler piece from delivery-valve holder.

Remove O-ring from delivery-valve holder.

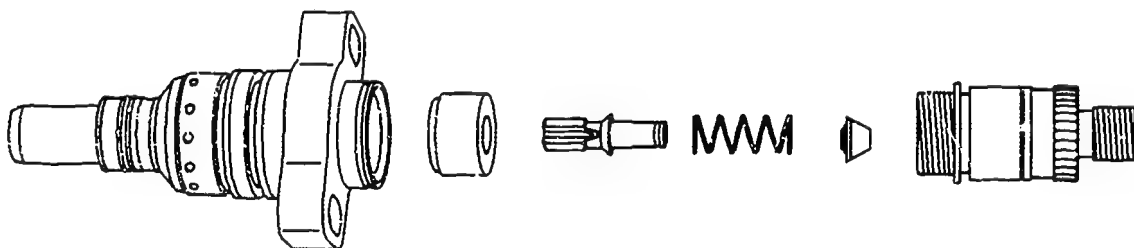
Remove constant-pressure valve from pump barrel.

Note:

On injection pumps of size R there is no seal between pump barrel and delivery-valve assembly.

Continue: C24/1 Fig.: C23/2

KMK05216



CLEANING OF PARTS

Wash out parts in commercially available cleaning agent, such as chlorothene NU, which is not readily flammable.

Pay attention to the following safety regulations !!!

In Germany:
Order Governing Work with Combustible Liquids (Vbf) as published by Federal Labor Ministry (BmA).

Continue: C24/2

CLEANING PARTS

Recut threaded holes in pump housing for intermediate bearing and governor housing with tap, then wash out and blow out.

Continue: C25/2

SAFETY MEASURES

Safety regulations for handling chlorinated hydrocarbons

Companies ZH 1 / 222

Employees ZH 1 / 129

as published by the Main Body of the

Liability Insurance Associations

**(Central Association for Accident
Prevention and Industrial Medicine)**

Langwartweg 103, 53129 Bonn.

In all other countries the local regulations are to be observed.

Continue: C26/1

CHECKING COMPONENT PARTS - WEAR ASSESSMENT

Renew worn or damaged parts.

**Always renew packing disks, O-rings,
support rings and snap rings.**

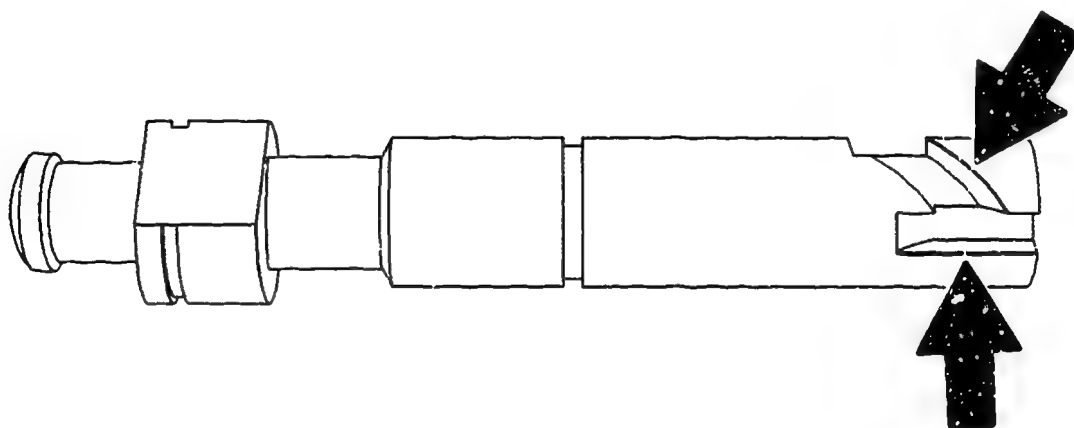
**Pay particular attention to helices of
pump plungers.**

**The helices must have sharp edges and
must not be rounded (arrows).**

**The bearing surfaces must not reveal
any signs of tracking or scoring.**

Continue: C27/1 Fig.: C26/2

KMK01253



CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

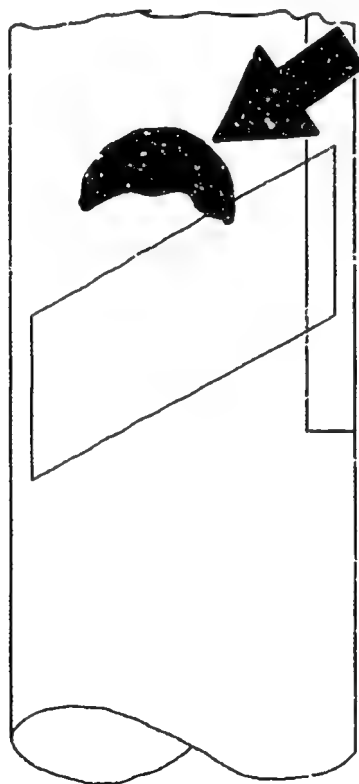
Pay attention to the following information, so as to avoid uncertainty regarding the assessment of plunger-and-barrel assemblies:

It is appropriate to renew the plunger-and-barrel assemblies in the event of:

- * Cavitation in the area of the helices (arrow).
- * Plunger-and-barrel seizure or sticking as a result of dirt or surface coating becoming apparent in slide test (plunger in barrel).

Continue: C28/1 Fig.: C27/2

KMK01254



**CHECKING OF INDIVIDUAL COMPONENTS
- WEAR ASSESSMENT**

Note:

Wash out pump plunger and barrel in calibrating oil before performing slide test.

Hold pump plunger and barrel roughly perpendicular.

Pump plunger must slide downwards in barrel on account of its own weight.

Continue: D01/1

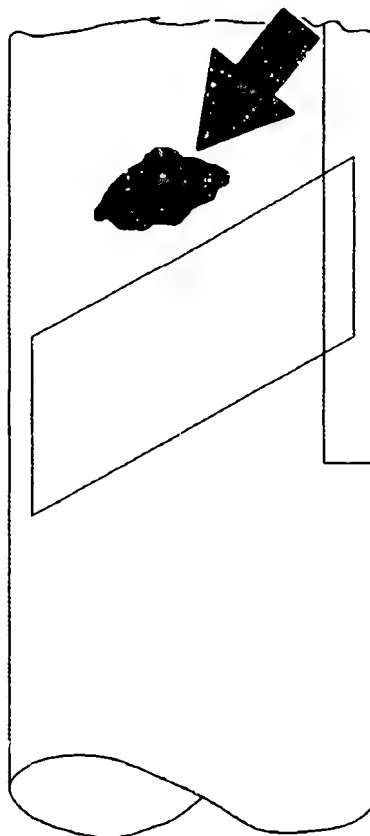
CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

Renewal of the plunger-and-barrel assemblies is not appropriate in the event of:

- * Cavitation above the helices (arrow).
- * Mat area around the entire periphery.
- * Bright bearing surfaces (without scoring and mechanical wear).
- * Discoloration at plunger and flange barrel as a result of fuel and lubricant residues, water in the fuel or the effect of temperature.

Continue: D02/1 Fig.: D01/2

KMK01255



CHECKING COMPONENT PARTS - WEAR ASSESSMENT

Note:

**Pumps of size R have n o seal
between pump barrel and delivery-
valve assembly.**

**As with all flanged-barrel pumps, the
sealing surfaces are not to be
damaged.**

**When performing repairs, plunger-and-
barrel assemblies and delivery-valve
assemblies may be individually
replaced.**

Continue: D03/1

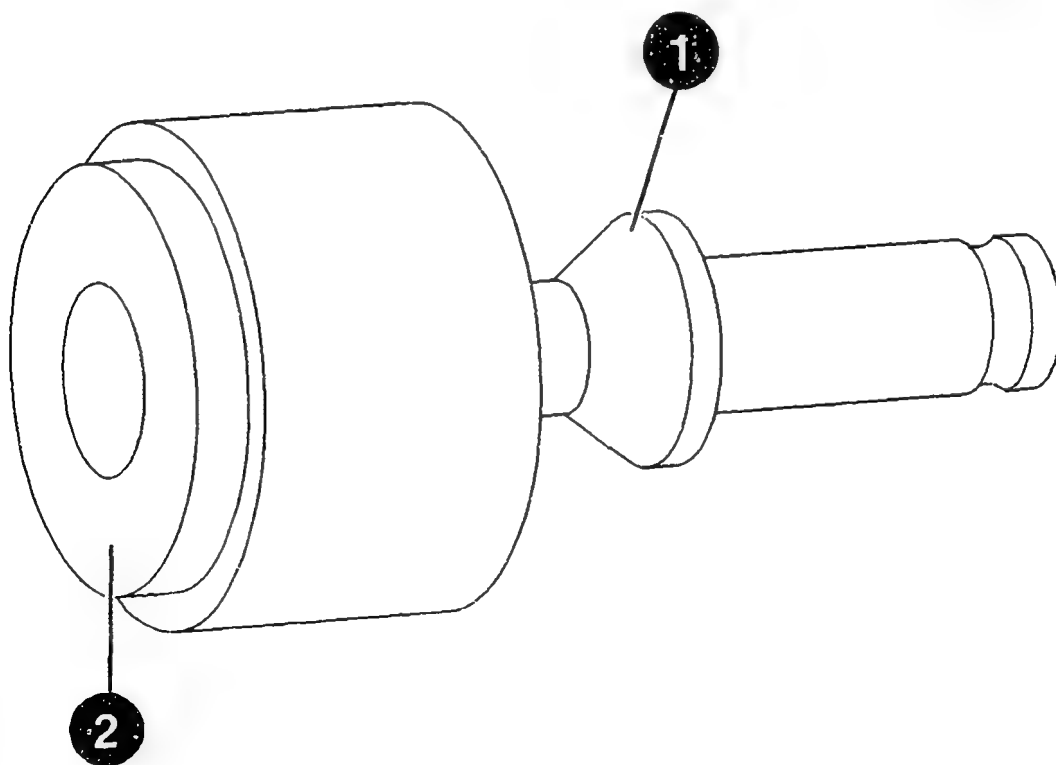
CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

The seat of the valve taper (1) and the sealing surface of the valve body (2) must not be dented, reveal cavitation or be unevenly worn.

Renew delivery valve if the valve sticks in the valve holder.

Continue: D04/1 Fig.: D03/2

KMK05217



CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

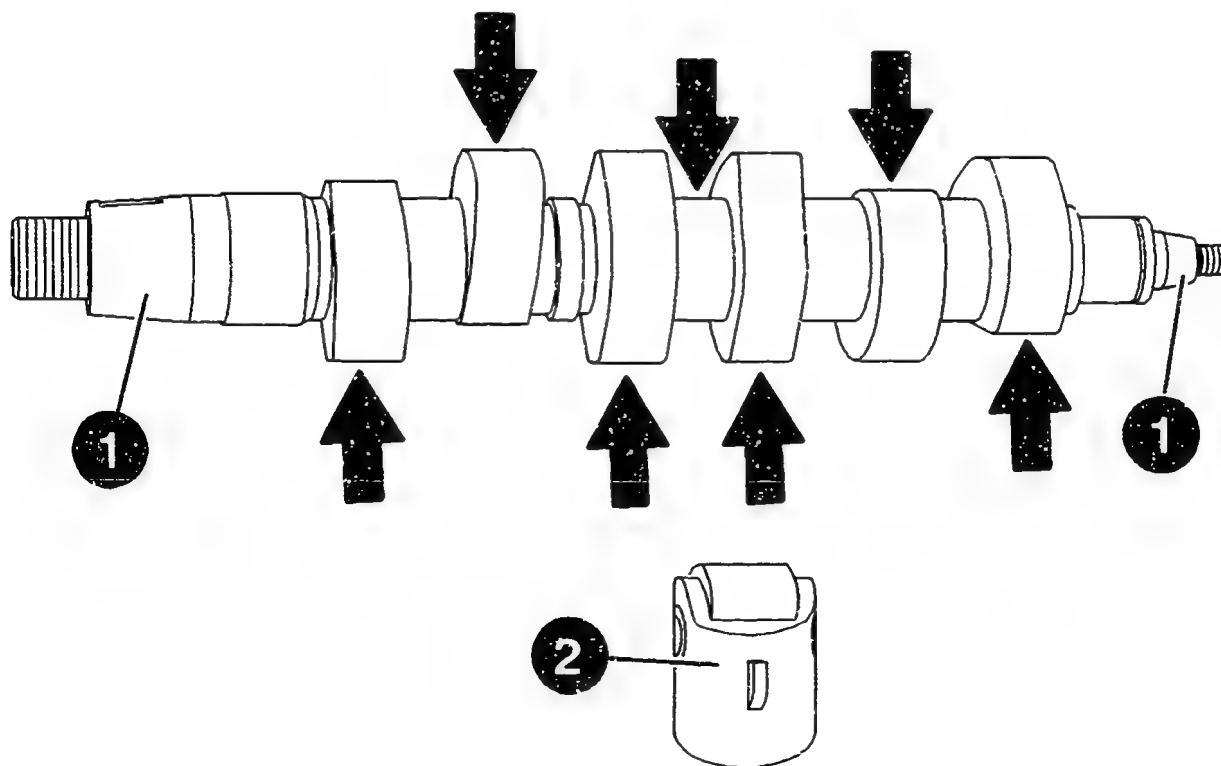
Renew the camshaft if it reveals pronounced running marks (arrows) or if a taper (1) is damaged. If the roller tappet (2) shows corresponding signs of wear, this is likewise to be replaced.

The replacement of roller tappets always results in the renewal of the camshaft.

Intermediate bearings which reveal running marks are to be replaced. If roller-tappet-shell seizure does not damage the camshaft, then it can be re-used.

Continue: D05/1 Fig.: D04/2

KMK01257

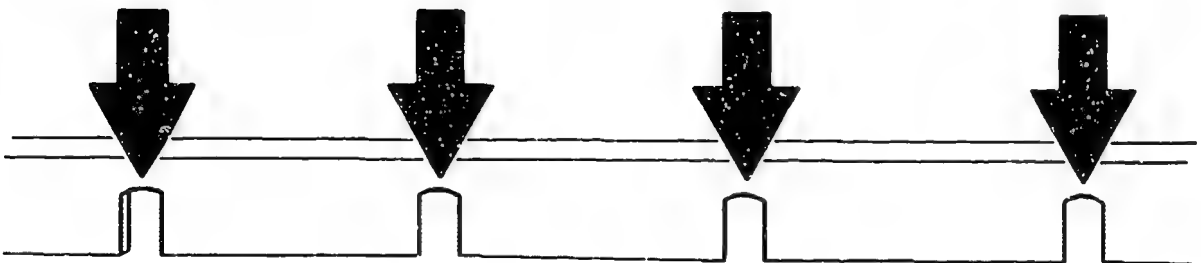


**CHECKING INDIVIDUAL COMPONENTS
- WEAR ASSESSMENT**

**Check control rod for worn grooves
(arrows) as well as drive hubs of
control sleeves for damage.**

Continue: D06/1 Fig.: D05/2

KMK01258



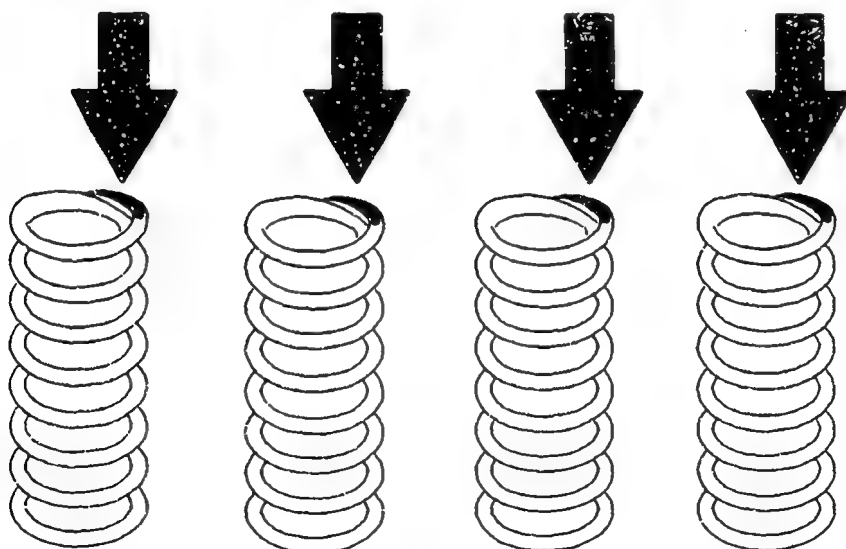
CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

Corroded plunger springs, or plunger springs which exhibit surface damage, must be replaced due to the danger of fracture.

Pay particular attention to the area of the 1st winding seating surface (arrows).

Continue: D07/1 Fig.: D06/2

KMK01259



ASSEMBLING BARREL-AND-VALVE ASSEMBLY

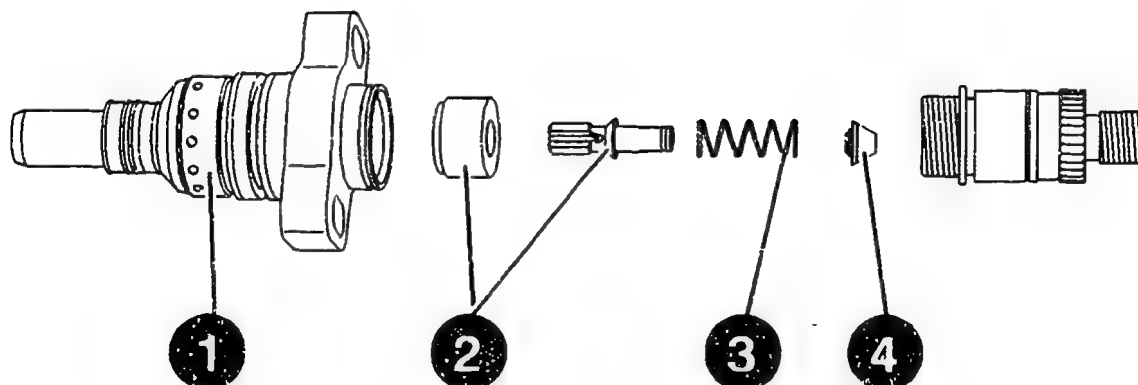
Place pump barrel (1) in assembly tool 0 986 611 356 (KDEP 2962). Insert constant-pressure valve (2) and valve spring (3) with existing spring plate or filler piece (4) in pump barrel.

Attention:

- * Do not use lubricant on underside of delivery-valve assembly and support surface for delivery-valve assembly in pump barrel; wetting with fuel or calibrating oil is permitted.
- * On pumps of size R there is no seal between pump barrel and delivery-valve assembly.

Continue: D08/1 Fig.: D07/2

KMK05218



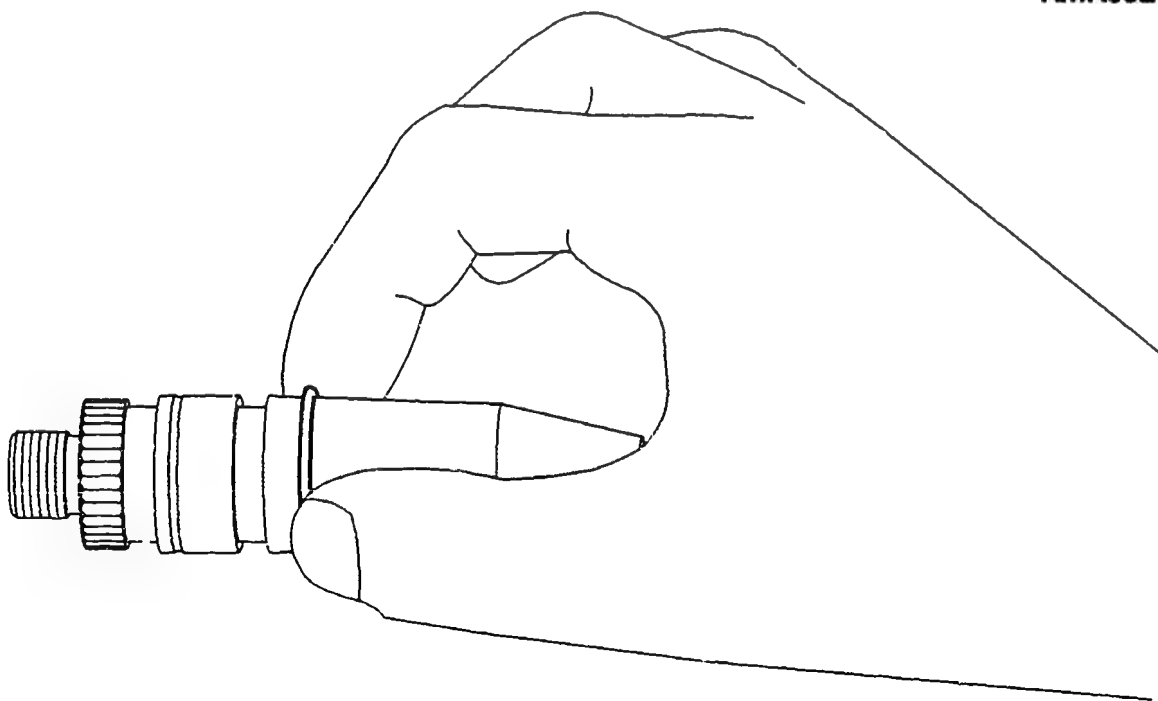
ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Slip O-ring over assembly sleeve
0 986 612 606 and push sleeve onto
delivery-valve holder as far as start
of recess.

O-ring can thus be slipped onto
delivery-valve holder without
being damaged.

Continue: D09/1 Fig.: D08/2

KMK05219



ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Immerse thread in transmission oil as far as O-ring and screw in delivery-valve holder by hand.

Pretighten delivery-valve holder with socket wrench 0 986 611 356

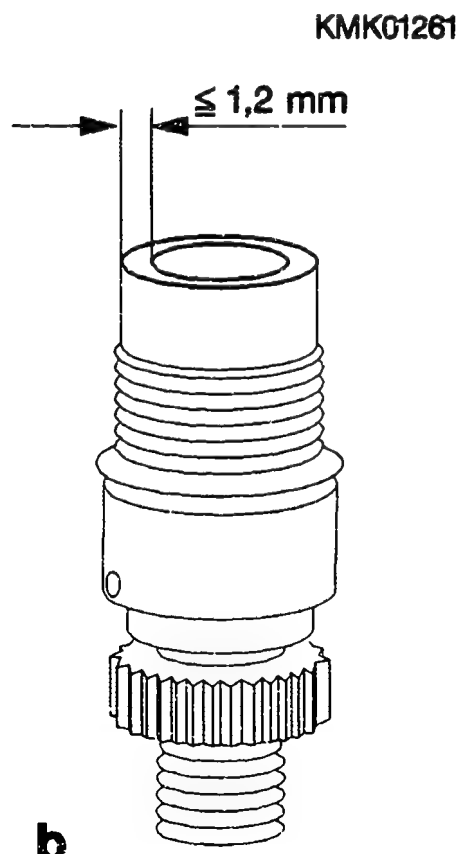
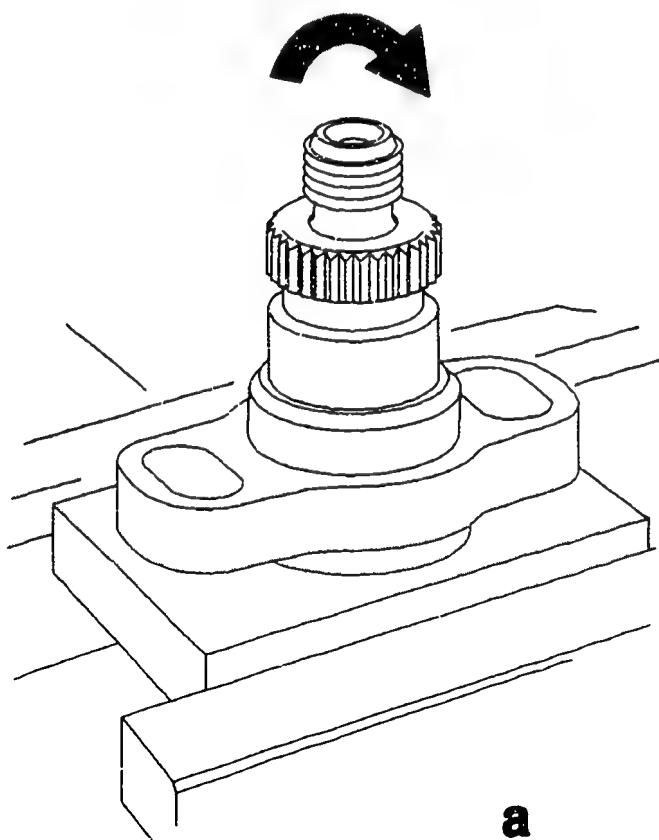
(KDEP 2962) to torque of approx. 50 Nm.

Then perform final tightening of delivery-valve holder in one operation to 110...120 Nm (fig. a).

Note:

Flattened gripping edge of delivery-valve holders already used must be ≤ 1.2 mm (fig. b).

Continue: D10/1 Fig.: D09/2

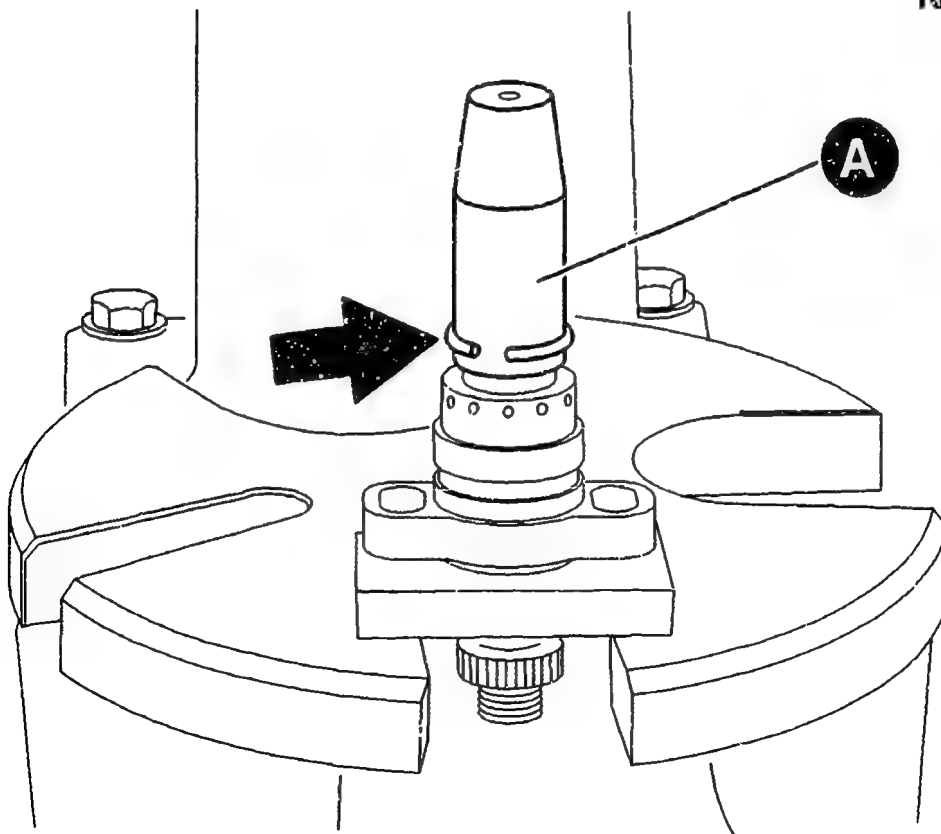


ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Turn pump barrel and place in assembly tool 0 986 611 356 (KDEP 2962) again. Attach impact cap to barrel. Slip retainer of impact cap over inner part of assembly tool 0 986 612 325 (KDEP 1714 - fig. A). Attach inner part of assembly tool 0 986 612 325 (KDEP 1714) to pump barrel.

Continue: D11/1 Fig.: D10/2

KMK01262

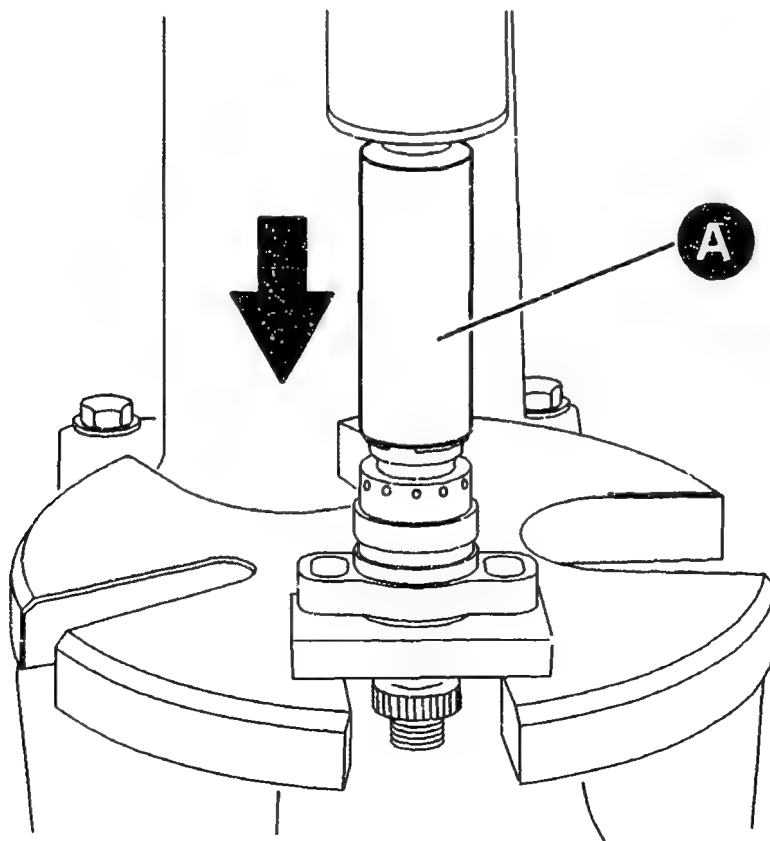


ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Outer part of assembly tool 0 986 612 325 (KDEP 1714 - fig. A) is then to be used to press retainer onto pump barrel (fig.).

Continue: D12/1 Fig.: D11/2

KMK01263

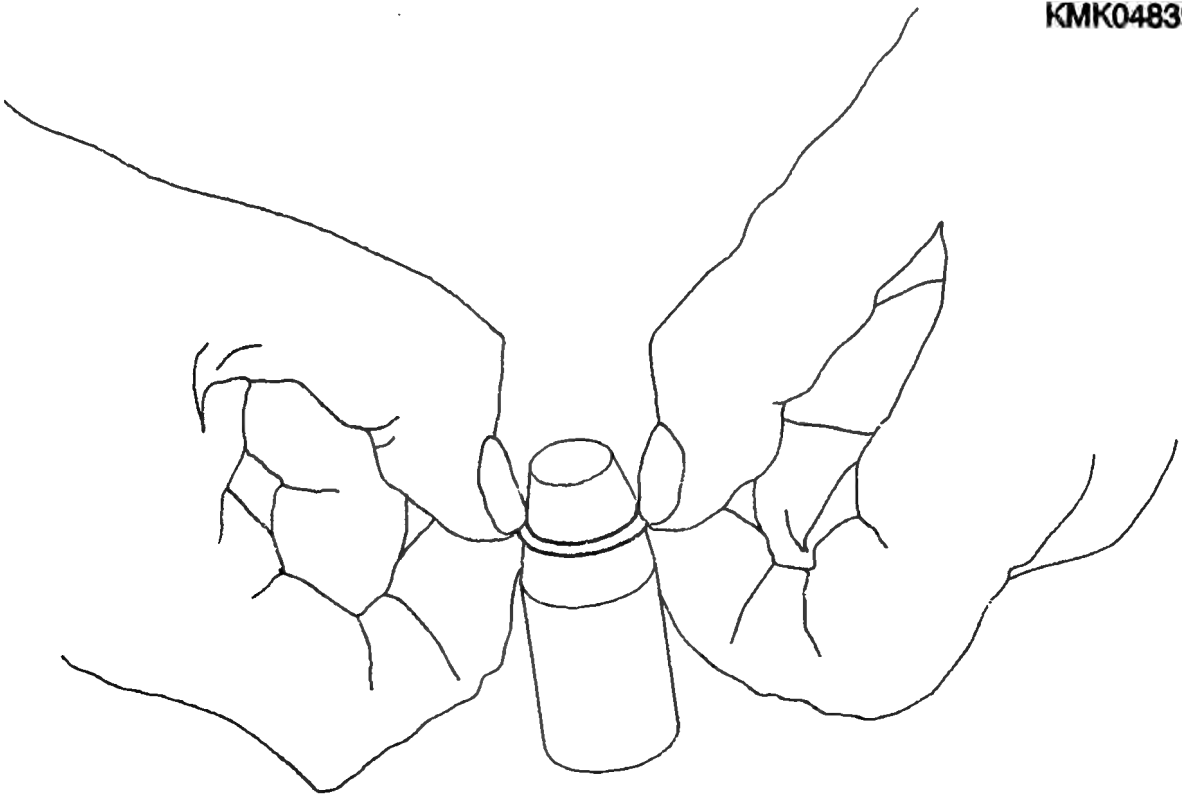


ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Position inner part of assembly tool
0 986 612 495 on firm base.
Hold support ring firmly between
thumb and index finger of both hands
and slowly press over taper onto
cylindrical section of inner part
(fig.).

Continue: D13/1 Fig.: D12/2

KMK04839

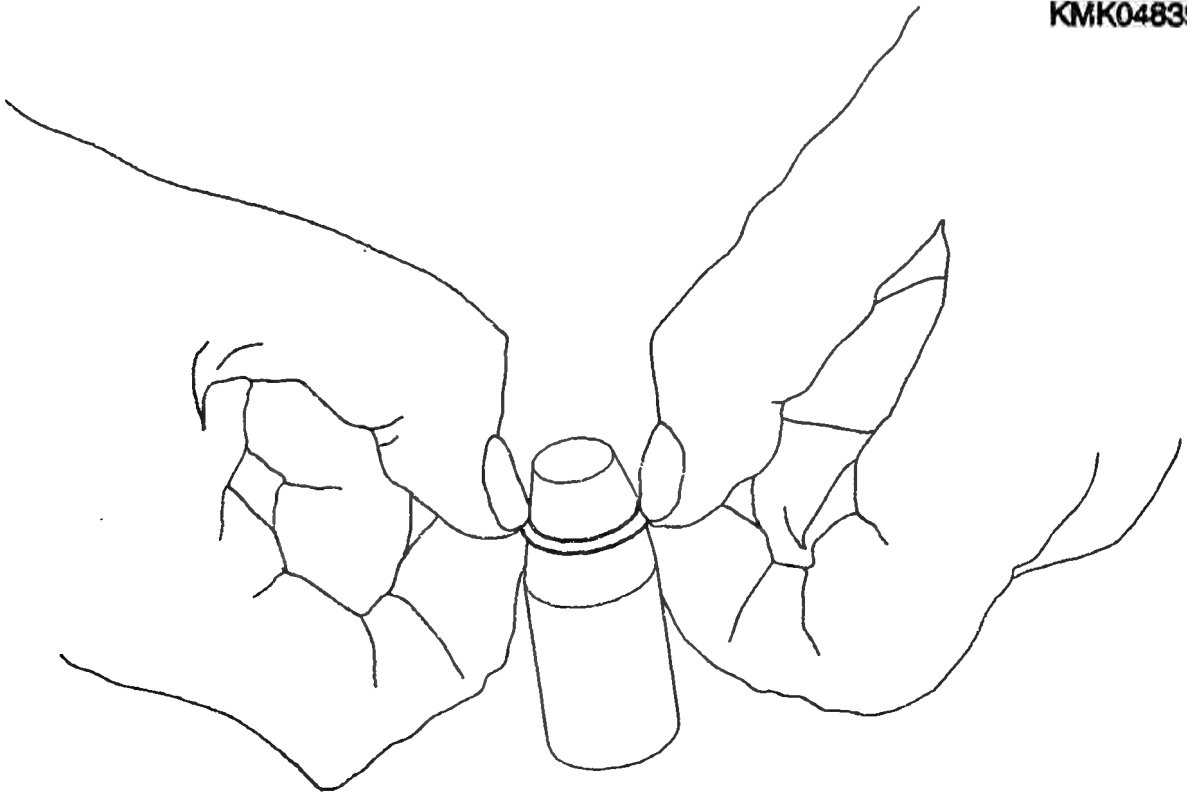


ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Whilst being slipped on, support ring adapts to size of assembly tool. If support ring is pushed on too quickly, there is a danger of it collapsing. If this is the case, permanent deformation prevents assembly and the ring has to be scrapped.

Continue: D14/1 Fig.: D13/2

KMK04839



ASSEMBLING BARREL-AND-VALVE ASSEMBLY

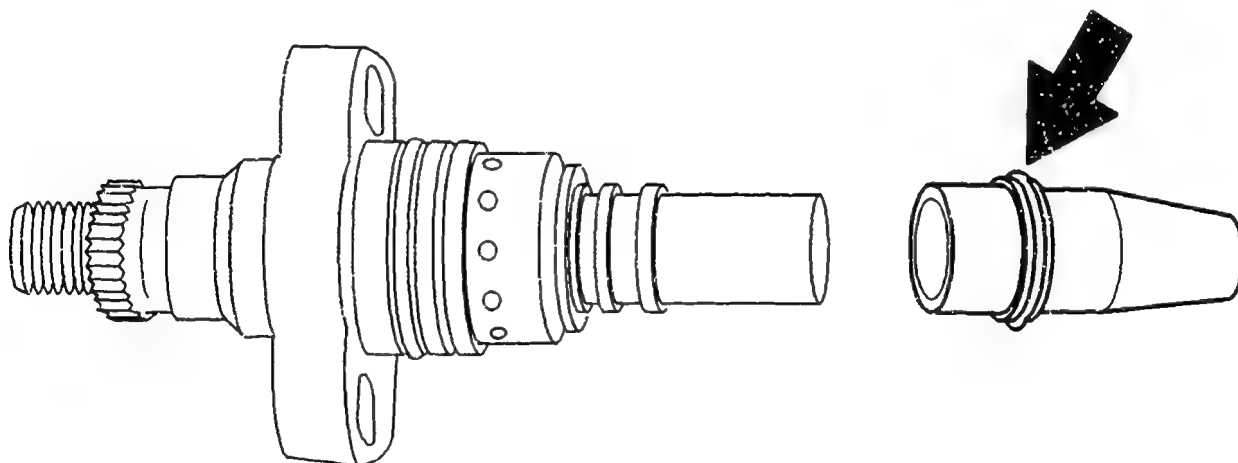
Slip O-ring over inner part such that it makes contact with support ring already fitted.

Fit second support ring accordingly.

Slide inner part with attached support ring/O-ring/support ring components (arrow) over assembly as far as they will go.

Continue: D15/1 Fig.: D14/2

KMK03652



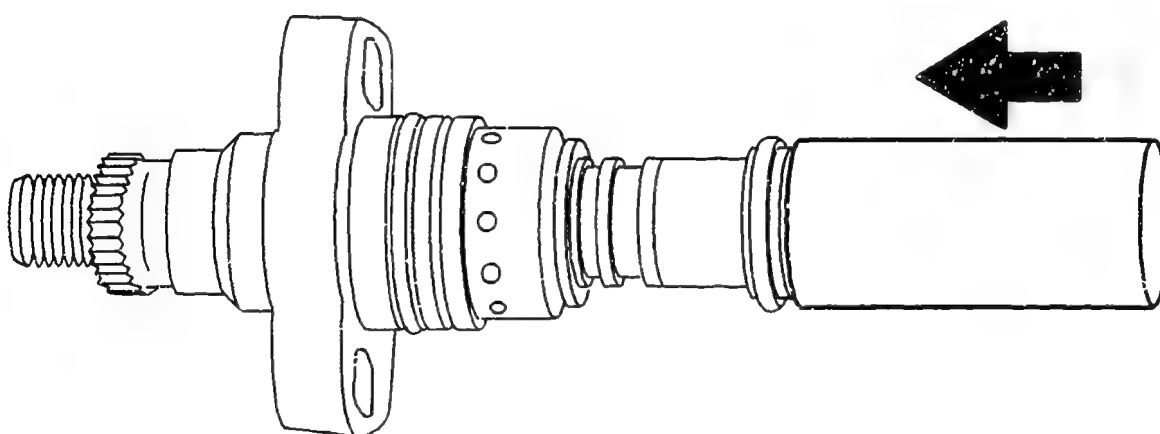
ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Slip support ring/O-ring/support ring
with outer part of assembly tool
0 986 612 495 onto assembly (fig.).

In doing so, make sure support ring
does not collapse.

Continue: D16/1 Fig.: D15/2

KMK03653



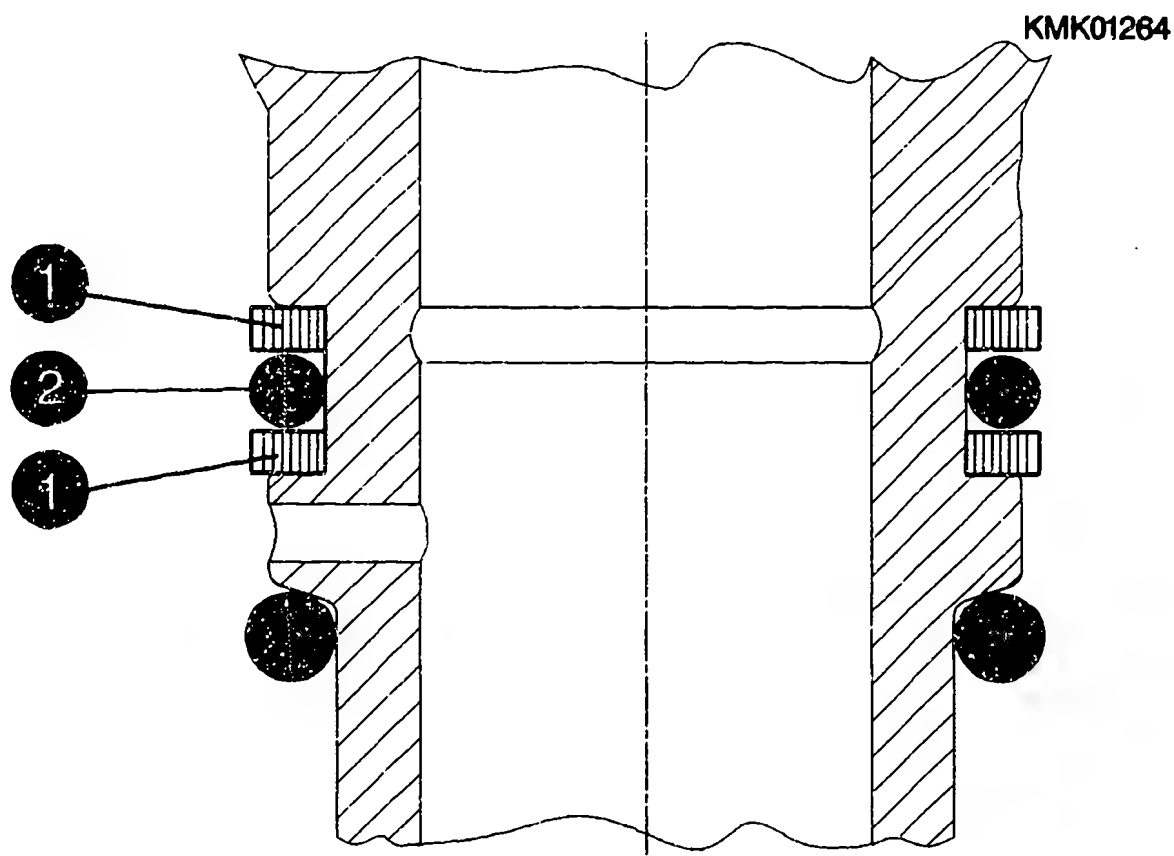
ASSEMBLING BARREL-AND-VALVE ASSEMBLY

Check whether position of support ring (1)/O-ring (2)/support ring (1) is as shown.

Note:

Support rings which collapse on assembly are to be replaced with new ones.

Continue: D17/1 Fig.: D16/2



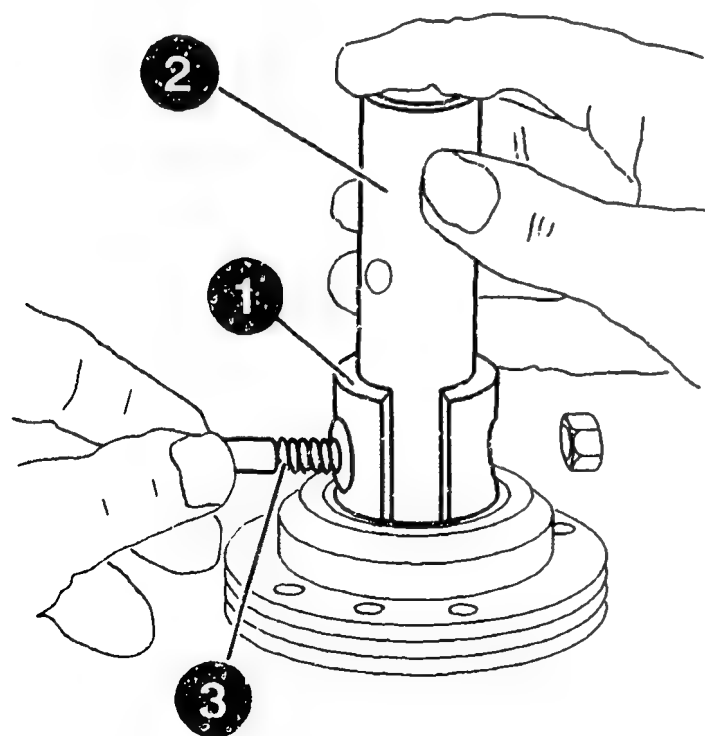
REPLACING CAMSHAFT BEARING - BEARING END PLATE

Remove cylindrical rollers of bearing on drive end and insert both halves of puller (1) 0 986 612 111 (KDEP 1570) into bearing outer race.

The holding mandrel (2) is then inserted between the extractors such that the connecting screw (3) can be slipped through all three parts (picture a).

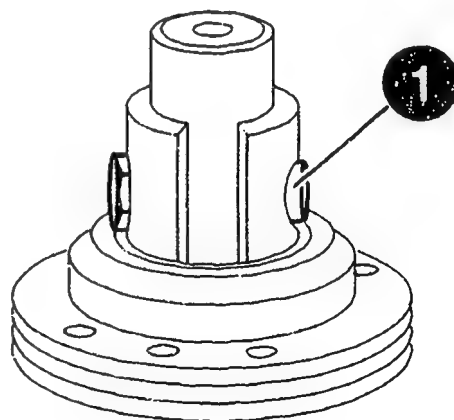
The fastening nut (4) is then screwed onto the connecting screw and tightened by hand (picture b).

Continue: D18/1 Fig.: D17/2



a

KMK01265

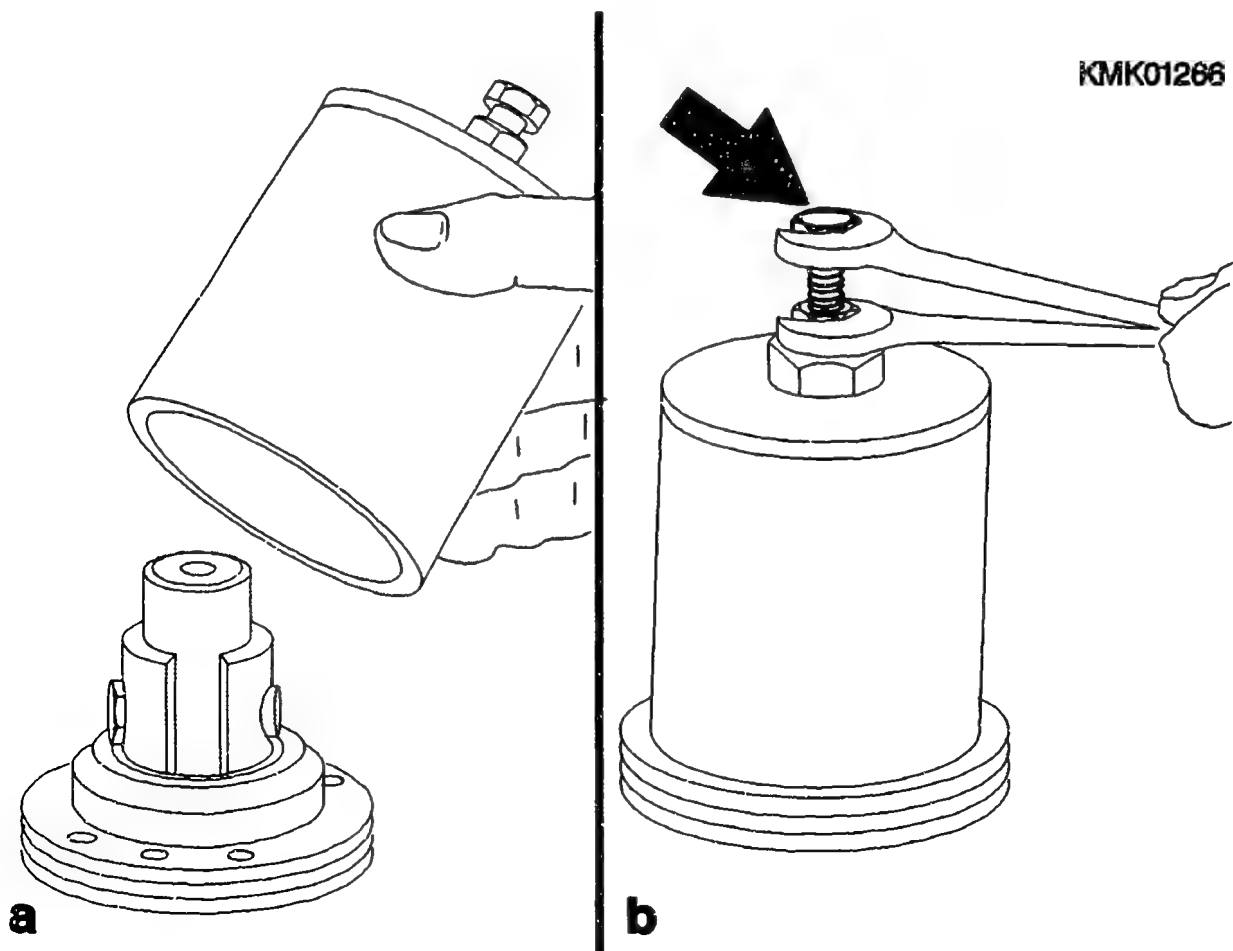


b

REPLACING CAMSHAFT BEARING - BEARING END PLATE

Position puller bell 0 986 612 108 (KDEP 1569/1) over fitted puller (fig. a). Screw pressing-off screw into nut of puller (arrow) and pull bearing outer race out of bearing end plate by turning nut with open-end wrench using puller 0 986 612 111 (KDEP 1570). In doing so, counterhold screw (fig. b).

Continue: D19/1 Fig.: D18/2



REPLACING CAMSHAFT BEARING - BEARING END PLATE

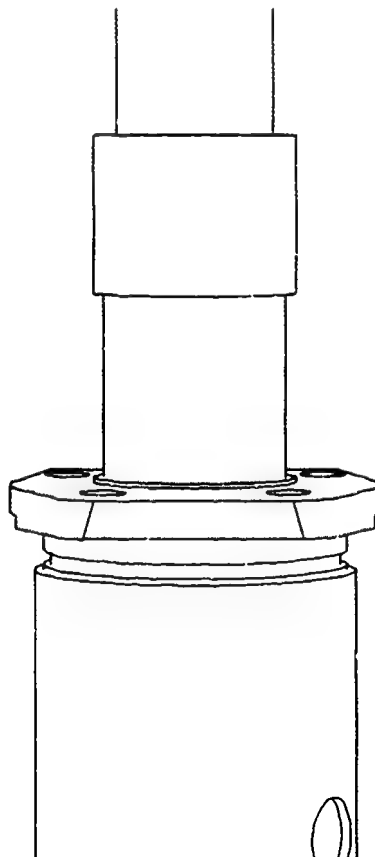
This operation destroys the bearing outer race. The entire bearing is to be scrapped and replaced with a new one.

The pressing-out mandrel 0 986 612 660 must be used to press out bearings with rollers which cannot be removed (fig.).

For taper 40 use pressing-out mandrel 0 986 612 648.

Continue: D20/1 Fig.: D19/2

KMK05220



REPLACING CAMSHAFT BEARING - BEARING END PLATE

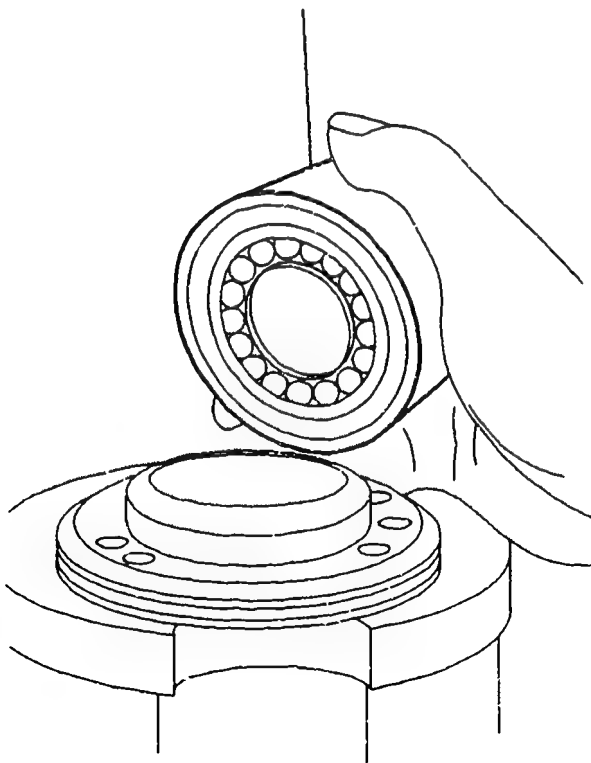
Attach cylindrical roller bearing to mandrel of pressing-in tool 0 986 612 659 for installation in bearing end plate on drive end (fig. a).

Press cylindrical roller bearing as far as it will go into corresponding hole in bearing end plate (fig. b).

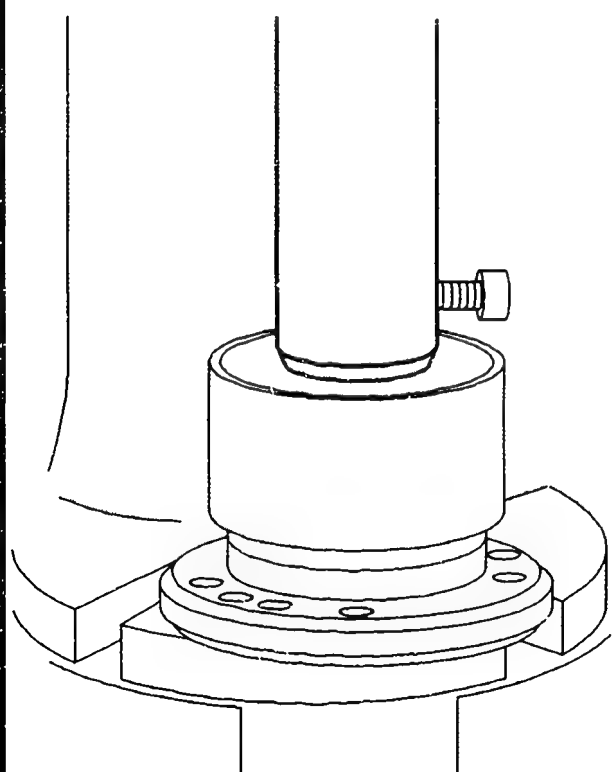
For pressing in bearing with taper 40 use pressing-in tool 0 986 612 647.

Continue: D21/1 Fig.: D20/2

KMK01267



a



b

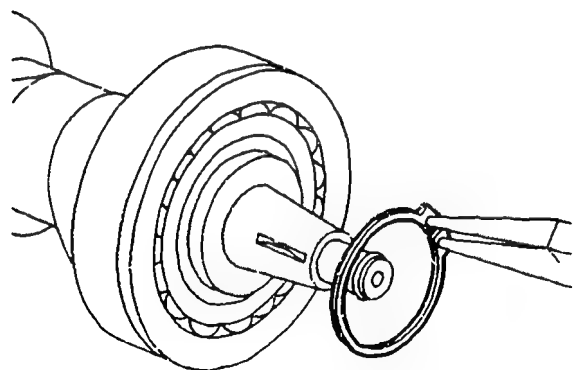
REPLACING CAMSHAFT BEARING - SELF-ALIGNING ROLLER BEARING

Remove retainer from camshaft
(picture a).

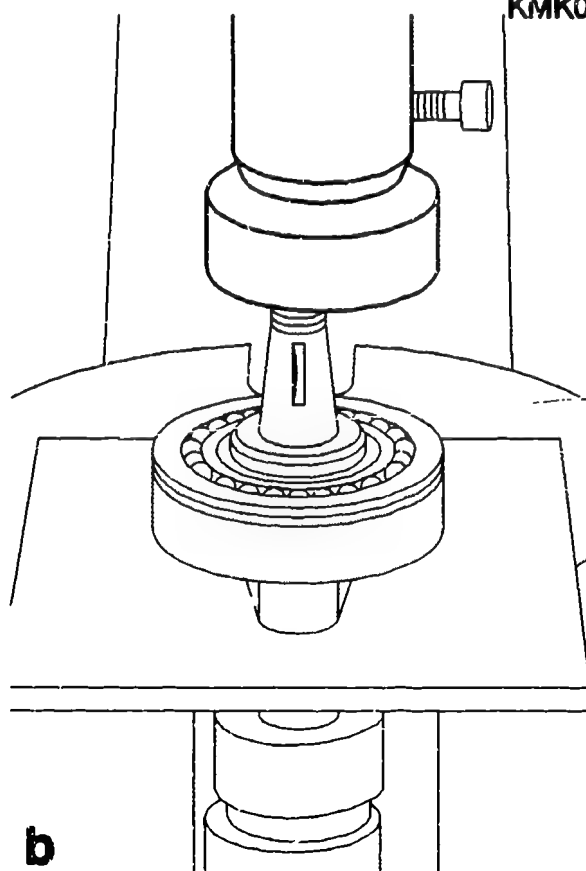
Press camshaft out of self-aligning
roller bearing using pressing-off
plate 0 986 612 134 (KDEP 1580)
as shown in picture b.

The bearing is destroyed.
Reuse is not permitted.

Continue: D22/1 Fig.: D21/2



a



KMK01268

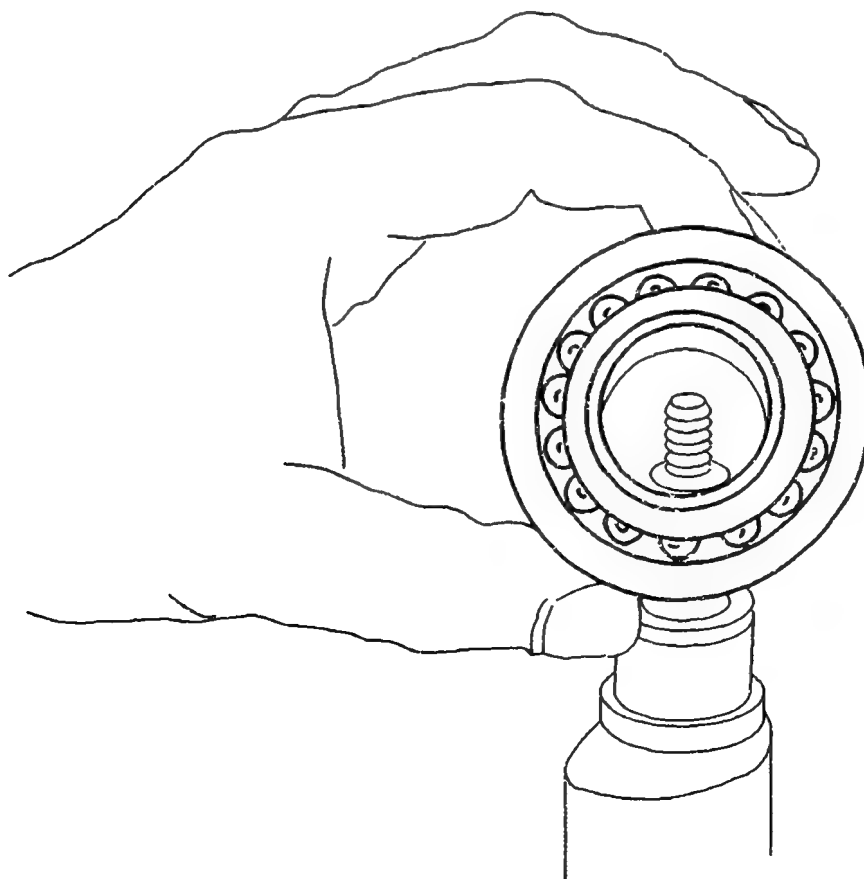
b

**REPLACING CAMSHAFT BEARING
- SELF-ALIGNING ROLLER BEARING**

Position camshaft perpendicularly and provisionally attach complete self-aligning roller bearing to camshaft.

Continue: D23/1 Fig.: D22/2

KMK01269



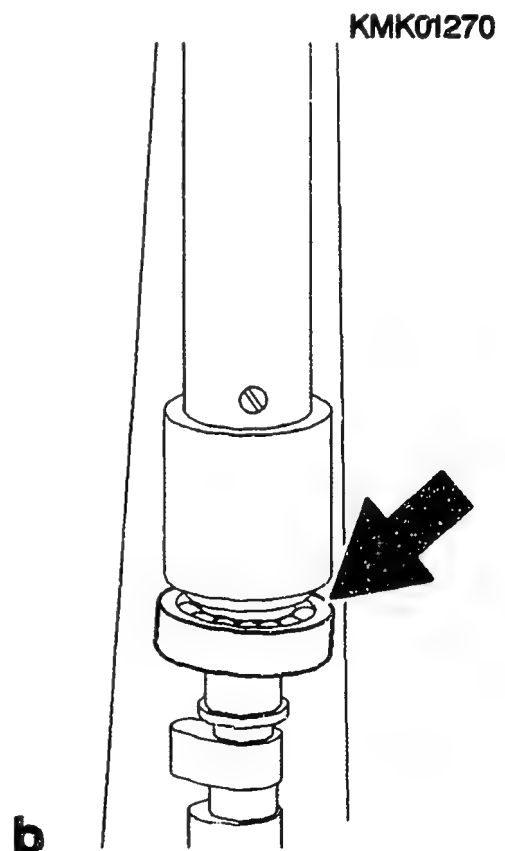
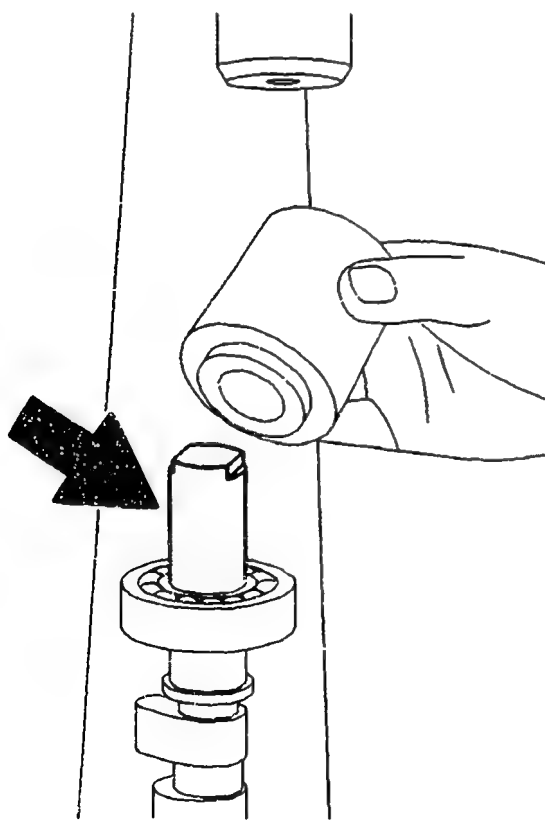
REPLACING CAMSHAFT BEARING - SELF-ALIGNING ROLLER BEARING

Screw guide bushing 0 986 612 493
(picture a - arrow) of pressing-in
tool 0 986 612 065 (KDEP 1552)
onto thread of camshaft.

Carefully attach sleeve of tool with
machined shoulder to inner race of
self-aligning roller bearing (picture
b - arrow) and press bearing as far
as it will go onto bearing seat of
camshaft.

When installing bearing, care is to
be taken to ensure that annular groove
of bearing outer race is on outside.

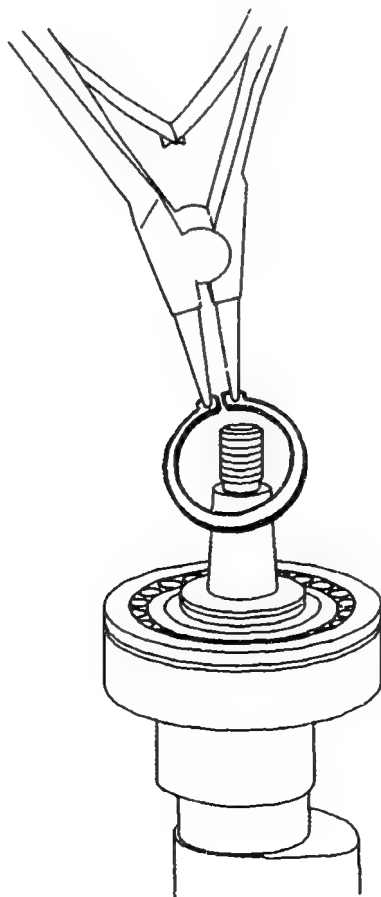
Continue: D24/1 Fig.: D23/2



**REPLACING CAMSHAFT BEARING
- SELF-ALIGNING ROLLER BEARING**

Fit shaft retaining ring.

Continue: D25/1 Fig.: D24/2



KMK01271

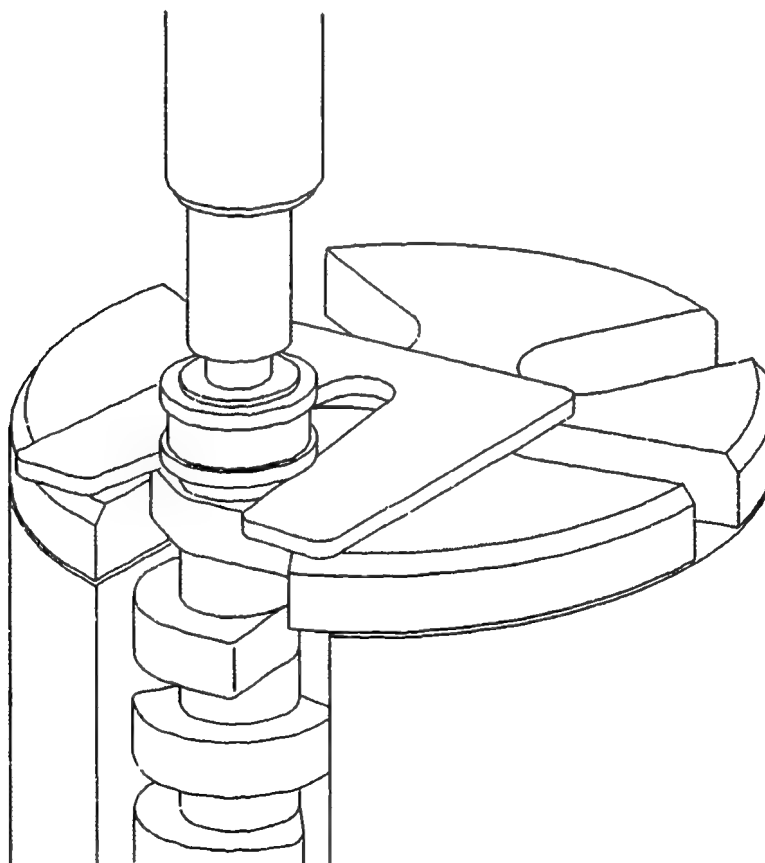
REPLACING CAMSHAFT BEARING - CYLINDRICAL ROLLER BEARING

Remove bearing outer support disk,
bearing outer race and rollers from
camshaft.

Screw guide bushing 0 986 612 493
onto camshaft.

Use pressing-off plate 0 986 612 134
(KDEP 1580) to press camshaft out
of inner race of cylindrical roller
bearing.

Continue: D26/1 Fig.: D25/2



REPLACING CAMSHAFT BEARING - CYLINDRICAL ROLLER BEARING

As a temporary measure hold new cylindrical roller bearing together with two clamps.

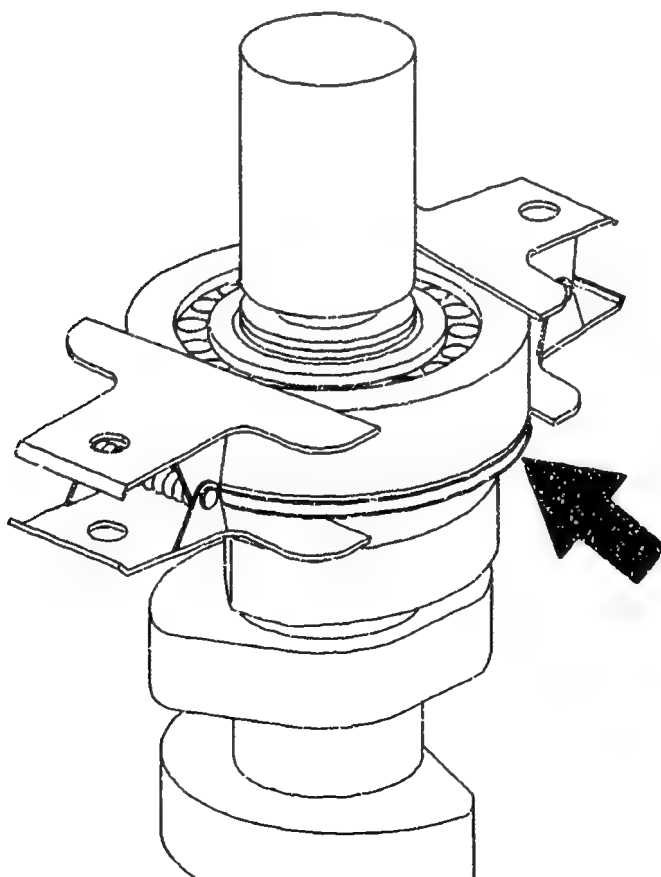
Slip roller bearing (bearing outer support disk facing camshaft) over guide bushing 0 986 612 493.

Carefully position pressing-in bushing of 0 986 612 065 with machined collar on inner race of cylindrical roller bearing and press bearing as far as it will go onto bearing seat of camshaft.

Clamps remain in position.

Continue: D27/1 Fig.: D26/2

KMK05222

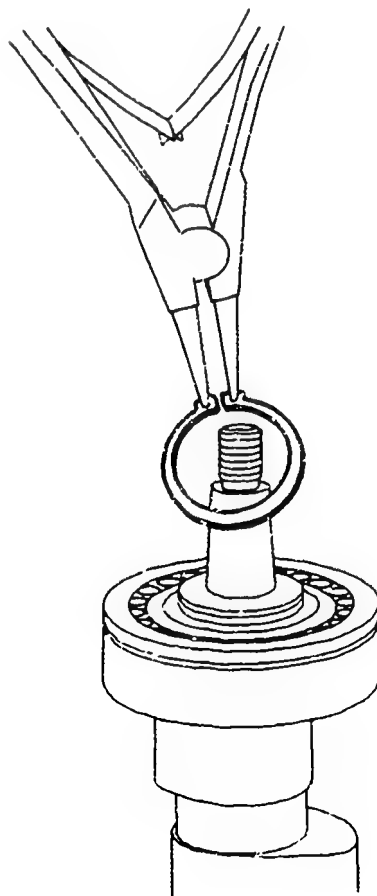


**REPLACING CAMSHAFT BEARING -
CYLINDRICAL ROLLER BEARING**

Fit shaft retainer.

Continue: D28/1 Fig.: D27/2

KMK01271



ASSEMBLING FUEL-INJECTION PUMP - STUD BOLT CHECK

Note:

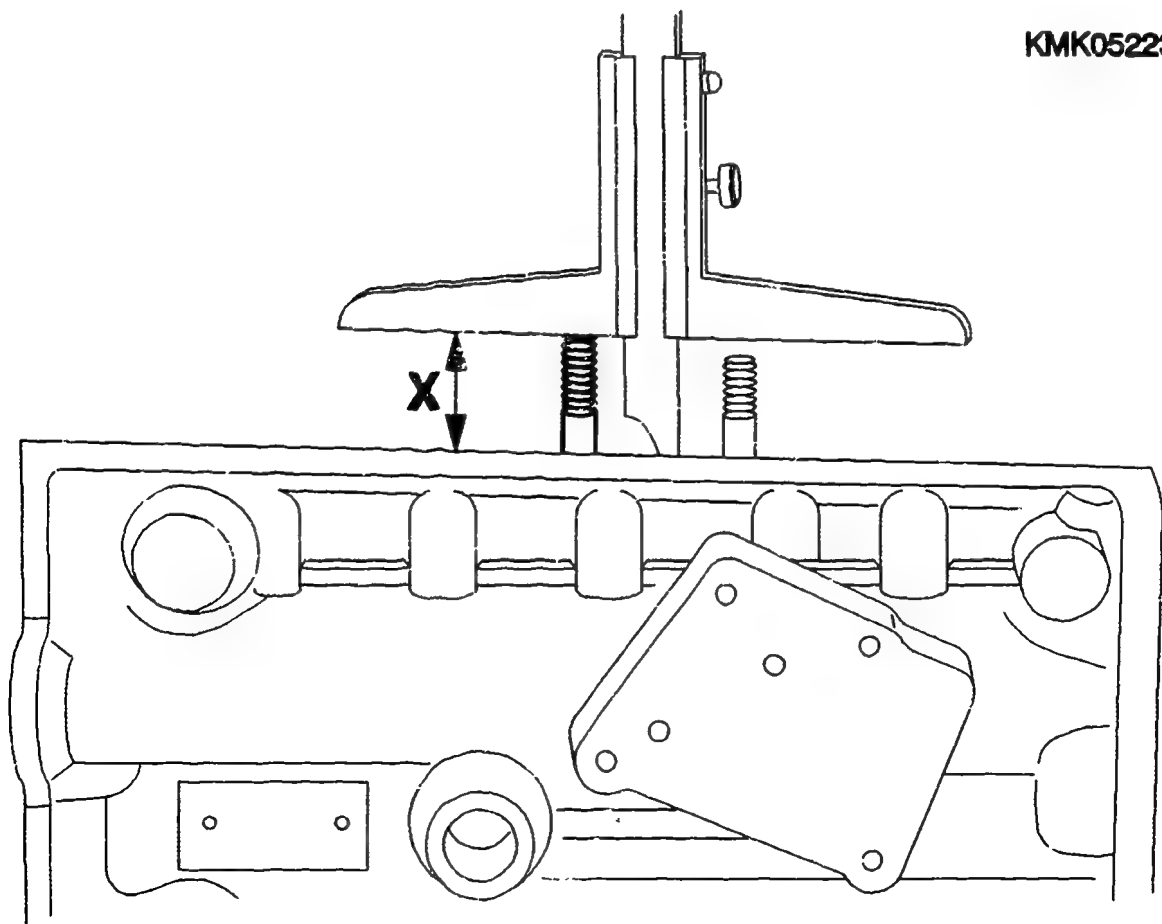
For reasons of clarity, only two stud bolts were left in the fuel-injection pump. The procedure described in the following is however to be employed with every stud bolt.

Use depth gauge to determine projection (dimension X) and compare to set value.

Set values - projection (dimension X):

- Short stud bolts: max. 26.80 mm
- Long stud bolts: max. 40.30 mm

Continue: E01/1 Fig.: D28/2



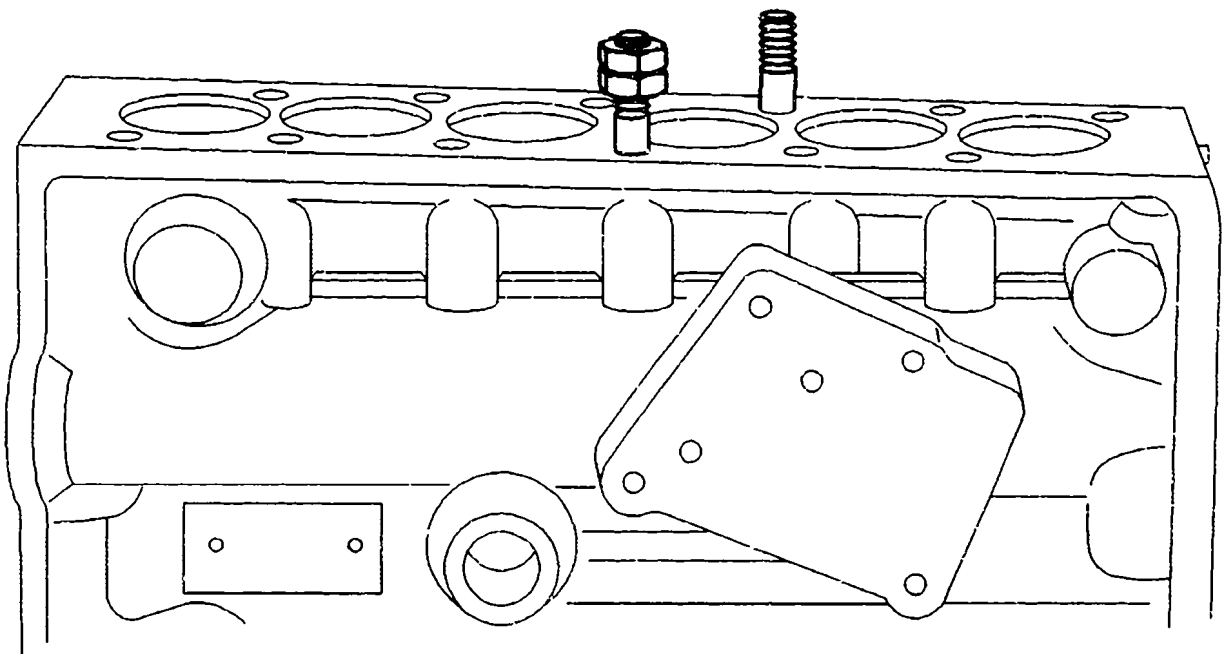
KMK05223

ASSEMBLING FUEL-INJECTION PUMP - STUD BOLT CHECK

If dimension determined does not coincide with set value, screw two hexagon nuts onto stud bolt and lock with respect to one another. Position nuts such that one stud bolt turn is still visible.

Continue: E02/1 Fig.: E01/2

KMK05224



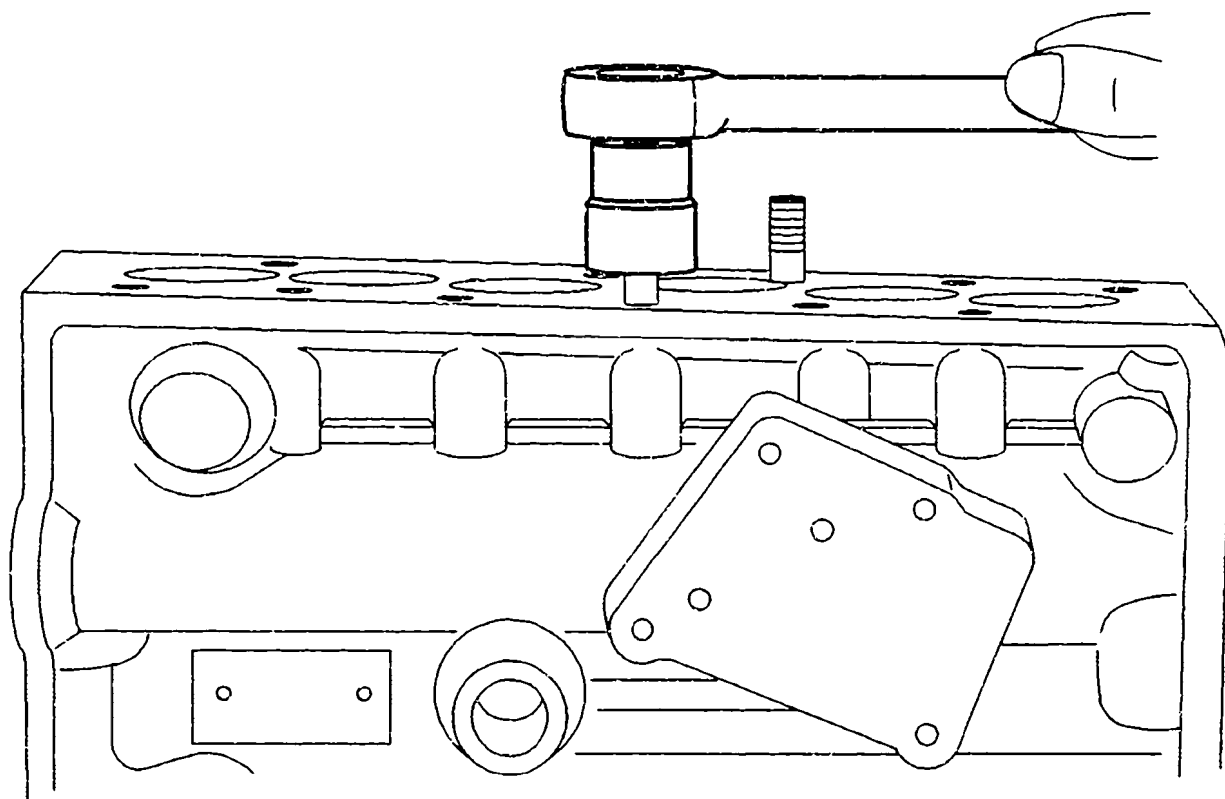
ASSEMBLING FUEL-INJECTION PUMP - STUD BOLT CHECK

Screw in/screw out stud bolt in line
with dimension determined.

When screwing in take care not to
exceed prescribed tightening
torque of 25...30 Nm.

Continue: E03/1 Fig.: E02/2

KMK05225

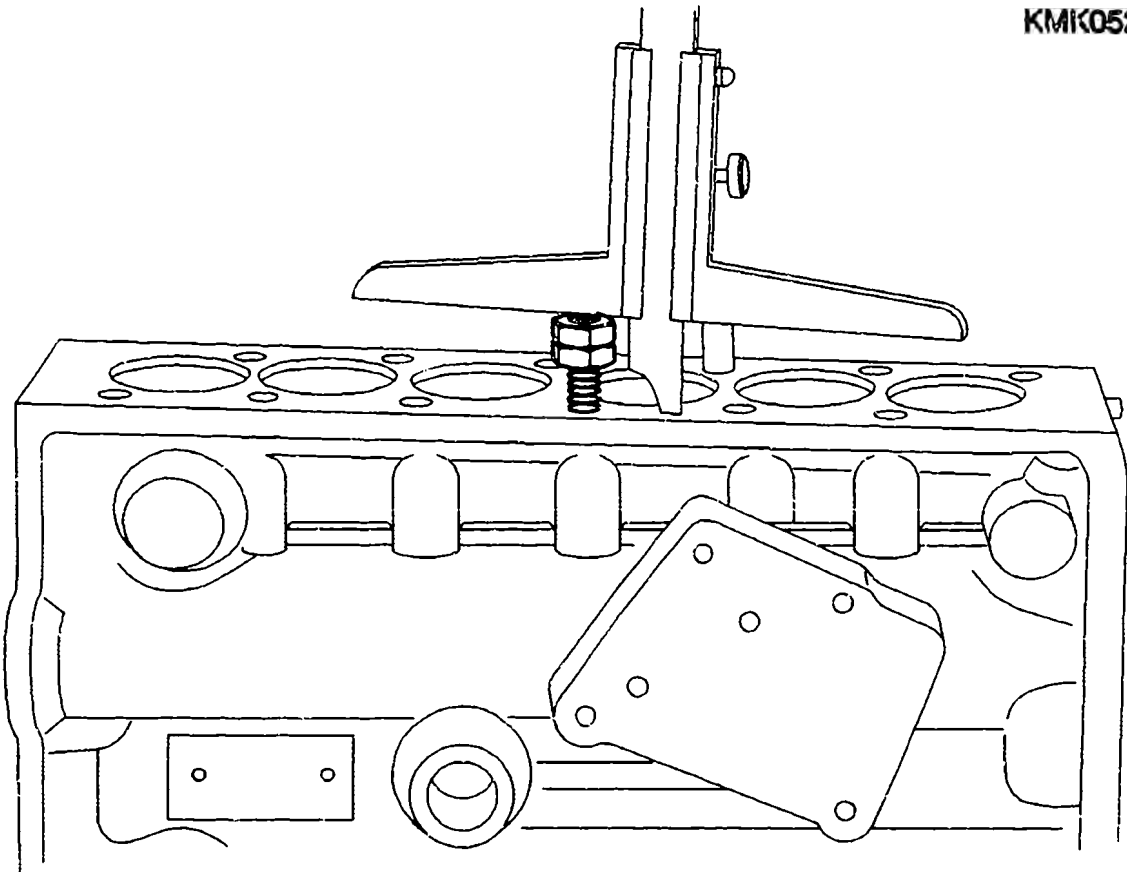


ASSEMBLING FUEL-INJECTION PUMP - STUD BOLT CHECK

If the determined dimension coincides with the set value, loosen and unscrew hexagon nuts.

Continue: E04/1 Fig.: E03/2

KMK05226



ASSEMBLING FUEL-INJECTION PUMP

Residual microencapsulation must be removed from threaded holes in pump housing with M6 tap. Then clean holes.

Continue: E05/1

FITTING BARREL-AND-FLANGE ELEMENTS

Insert barrel-and-flange element such that notch or center-punch mark faces control rod (back of pump).

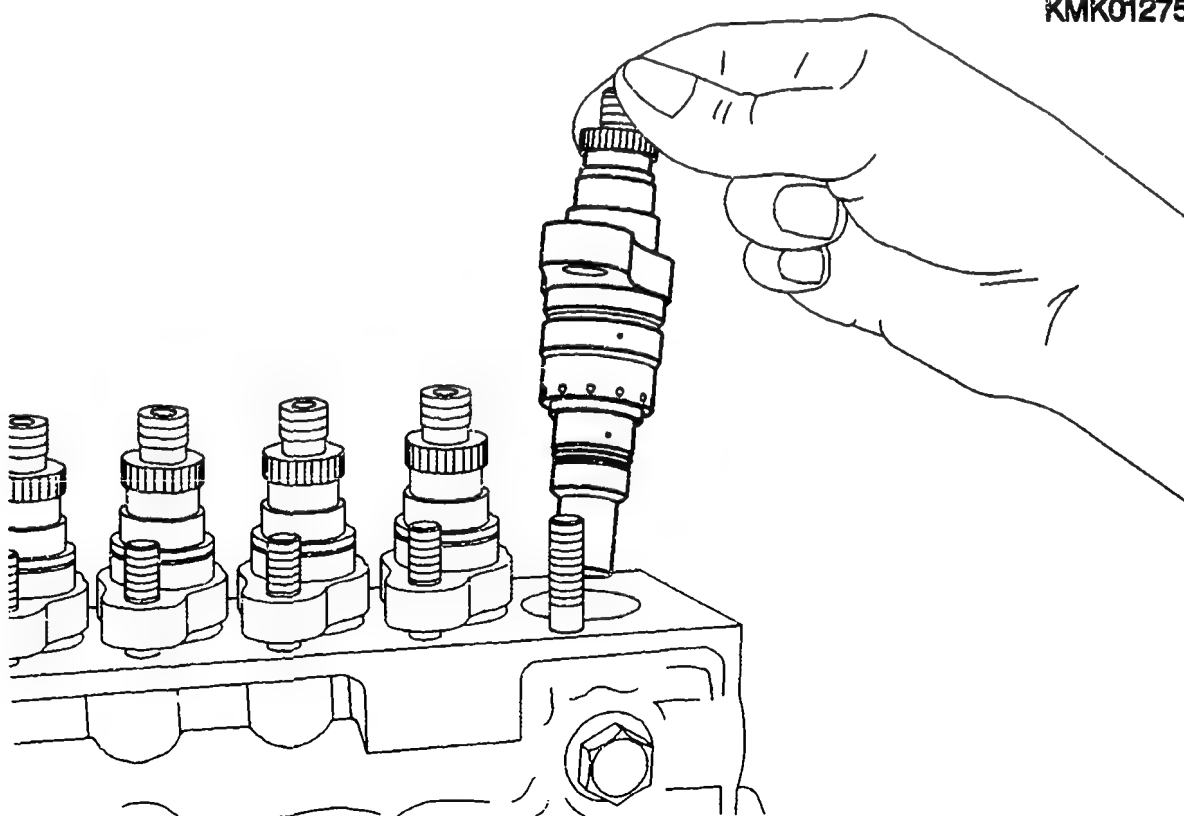
Do not force in barrel-and-valve assembly.

Screw on but do not tighten hexagon nut.

Turn barrel-and-valve assemblies such that stud bolts are in center of slots.

Continue: E06/1 Fig.: E05/2

KMK01275



ASSEMBLY OF FUEL-INJECTION PUMP

Moisten pump plunger with calibrating oil prior to assembly.

Rub over O-rings with tallow.

Continue: E07/1

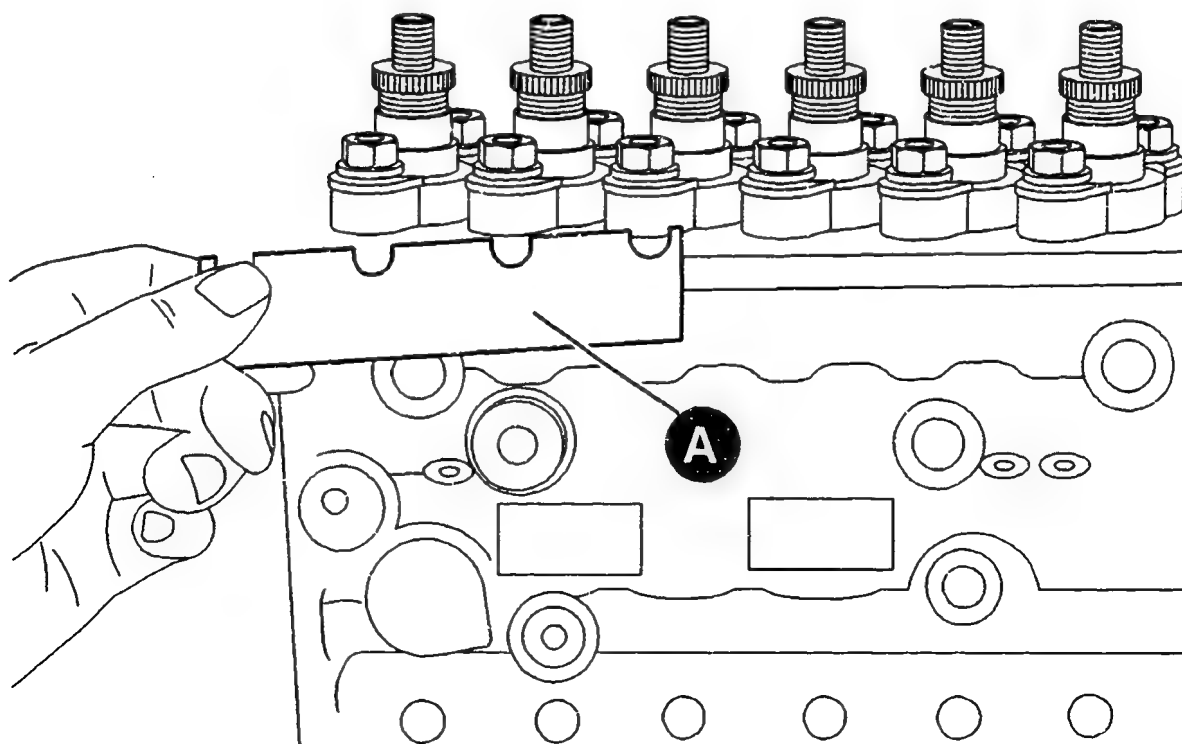
FITTING BARREL-AND-FLANGE ELEMENTS

Lift barrel-and-flange elements until spacer plates 0 986 612 061 (KDEP 1550 - fig. A) can be inserted beneath flanges.

Tighten fastening nut by hand such that spacer plates under flanges cannot fall out.

Continue: E08/1 Fig.: E07/2

KMK05146



CHECKING SUCTION GALLERY FOR LEAKS

Tilt pump. Moisten pump plunger with calibrating oil and insert into assembly cylinder.

Pay attention to freedom of movement.

Insert retaining pin 0 986 612 114 (KDEP 1571) in setting hole.

Unscrew pump from clamping frame.

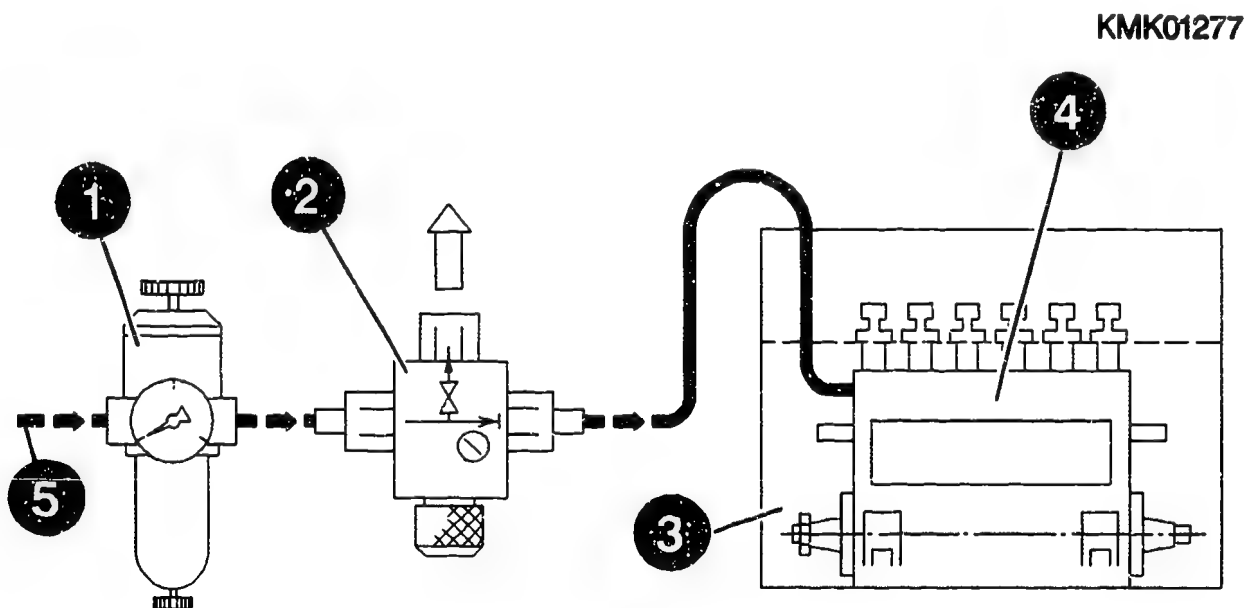
Connect up pump to compressed-air network via pressure reducer with water trap.

Continue: E09/1

CHECKING SUCTION GALLERY FOR LEAKS

- 1 = Pressure reducer with press. gauge
0 ... 6 bar and water trap
- 2 = Directional-control valve
0 986 615 111 (KDJE-P 100/1.1)
- 3 = Immersion tank with calibrating oil
- 4 = Fuel-injection pump
- 5 = Direction of flow of compressed
air

Continue: E10/1 Fig.: E09/2



CHECKING SUCTION GALLERY FOR LEAKS

Insert directional-control valve
0 986 615 111 (KDJE-P 100/1.1) of pressure measuring device into compressed-air inlet to achieve prescribed pressure reduction during leak test

For test purposes, immerse pump perpendicularly in test bath.

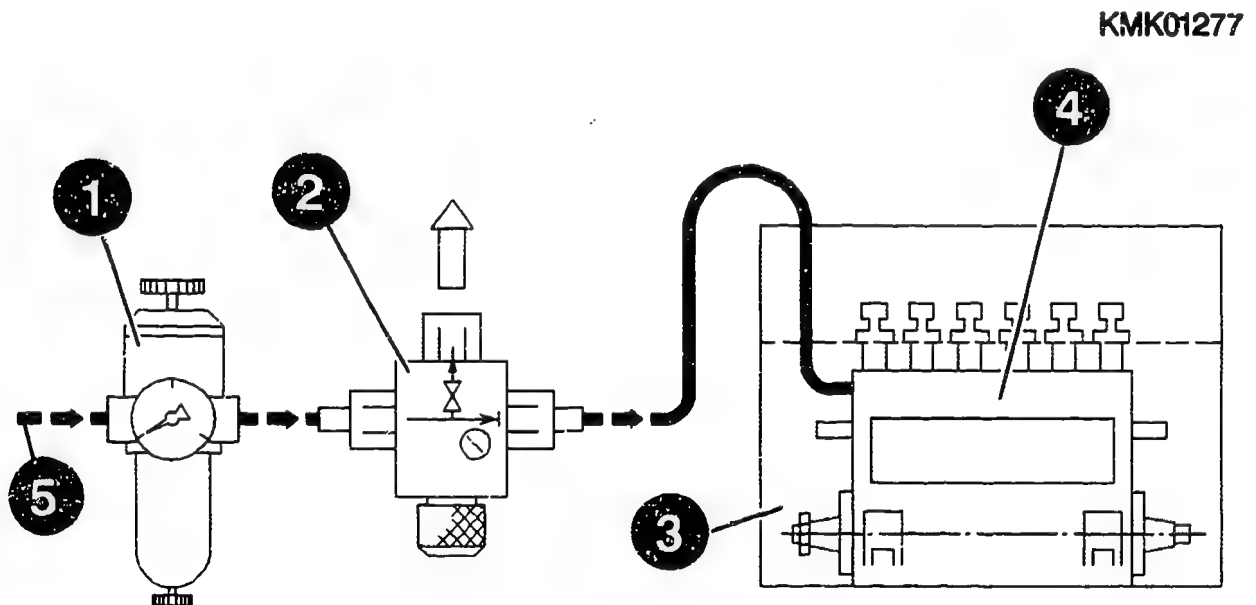
Calibrating oil must not be allowed to flood over the openings in the delivery-valve holders.

Continue: E11/1

CHECKING SUCTION GALLERY FOR LEAKS

- 1 = Pressure reducer with press. gauge
0 ... 6 bar and water trap
- 2 = Directional-control valve
0 986 615 111 (KDJE-P 100/1.1)
- 3 = Immersion tank with calibrating oil
- 4 = Fuel-injection pump
- 5 = Direction of flow of compressed air

Continue: E12/1 Fig.: E11/2



SUCTION-GALLERY LEAK TEST

Swivel pump only to localize a possible leak.

Test duration and test pressure:
8 minutes at 5 bar
then 1 minute pulsating 0 ... 5 bar

Leakages in the area of the suction gallery are not permitted.
Pay particular attention to freedom from leaks of assembly seats.

Leaks between assembly cylinder and plunger are an exception.

Continue: E12/2

SUCTION-GALLERY LEAK TEST

Remove pump from test bath and attach to clamping support.

Remove retaining pins.

Pull pump plunger out of barrel-and-valve assembly.

Note:

To avoid possible skin irritation, apply protective cream to hands before commencing test and wash hands in soap and water upon completion of testing. Use rubber gloves where possible.

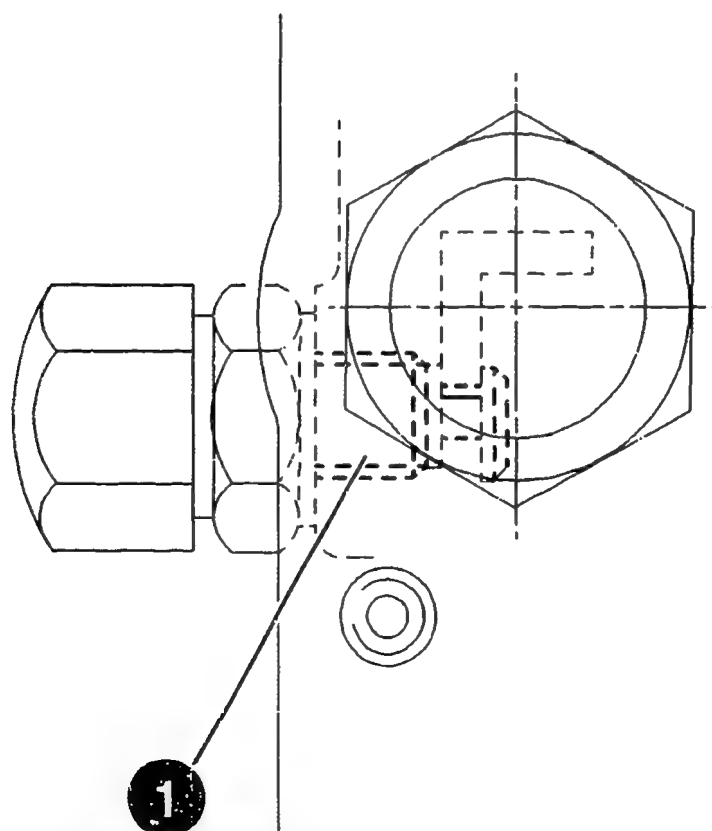
Continue: E13/1

INSTALLING CONTROL ROD (RE-POSITIONER)

Screw control-rod guide screw (1) into pump housing but do not fit cap nut and lock nut.

Continue: E14/1 Fig.: E13/2

KMK01246



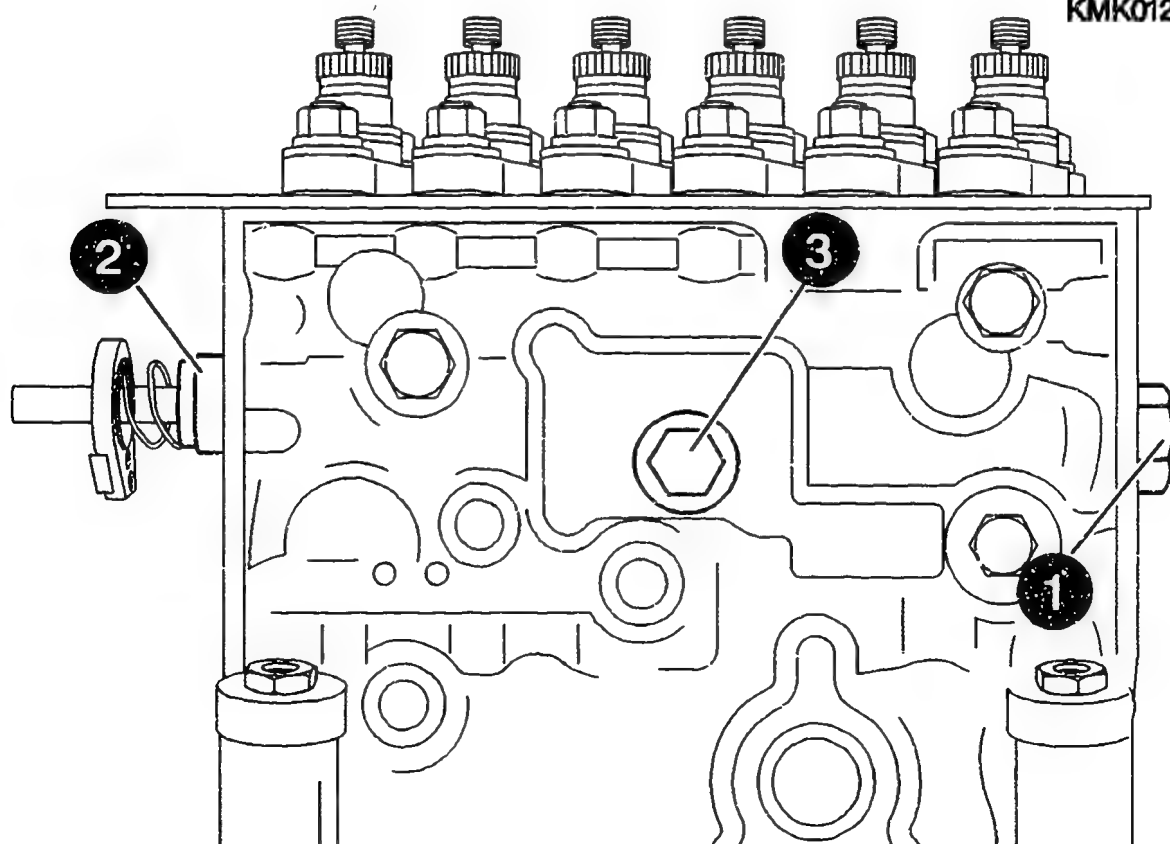
INSTALLING CONTROL ROD (RE-POSITIONER)

Insert control rod on governor end and tighten control-rod nut (2) to 30 ... 40 Nm.

Screw in screw plug with seal ring (1) and tighten to 30 ... 40 Nm.

Continue: E15/1 Fig.: E14/2

KMK01245



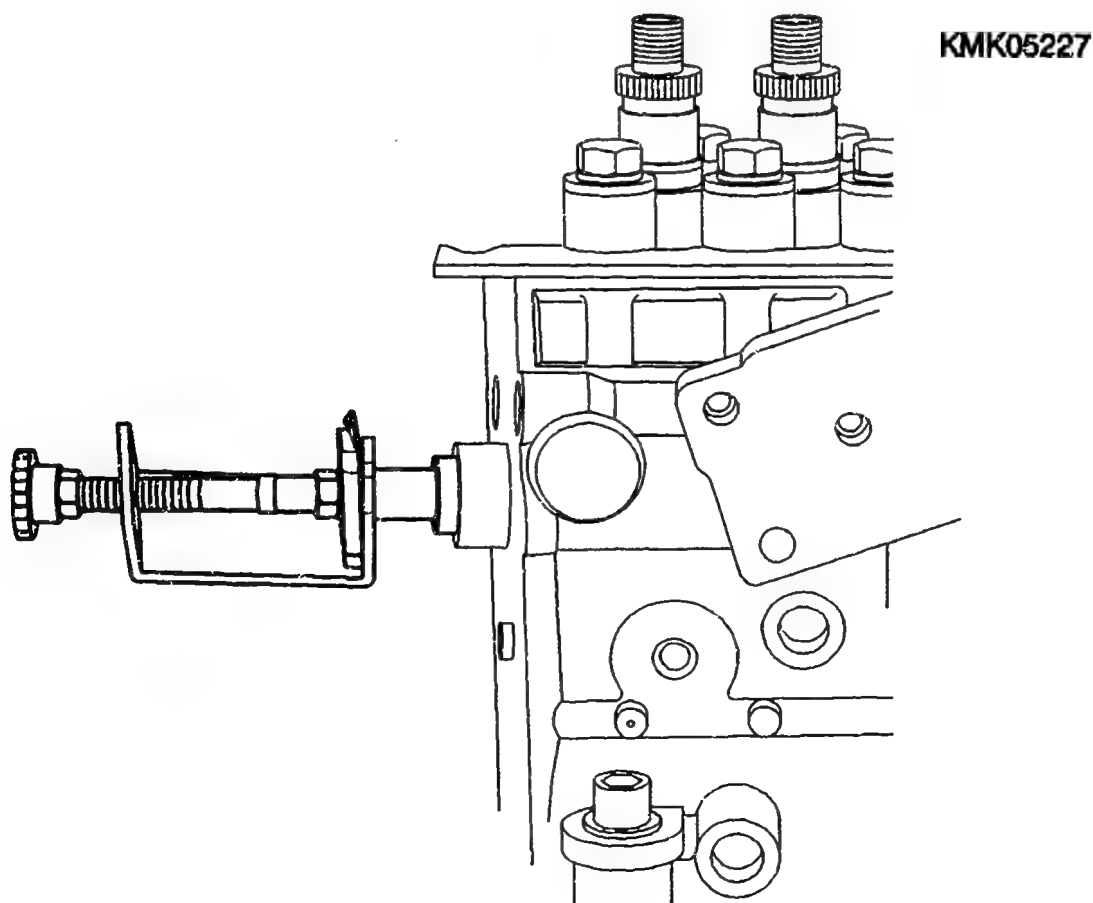
INSTALLING CONTROL ROD (RE-POSITIONER)

Check whether control rod moves freely.

Note:

Before checking freedom of movement of control rod, control-rod return spring must be pretensioned with spring tensioner 0 986 612 311 (KDEP 1704) and thus made inoperative.

Continue: E16/1 Fig.: E15/2

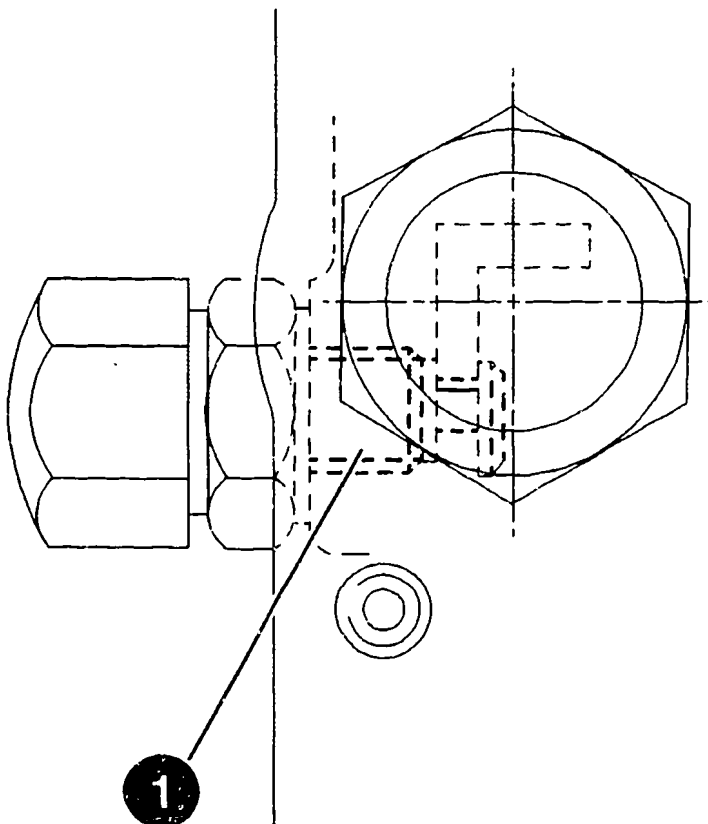


INSTALLING CONTROL ROD (MECH. GOVERNOR)

Screw control-rod guide screw (1) into pump housing but do not fit cap nut and lock nut.

Continue: E17/1 Fig.: E16/2

KMK01246



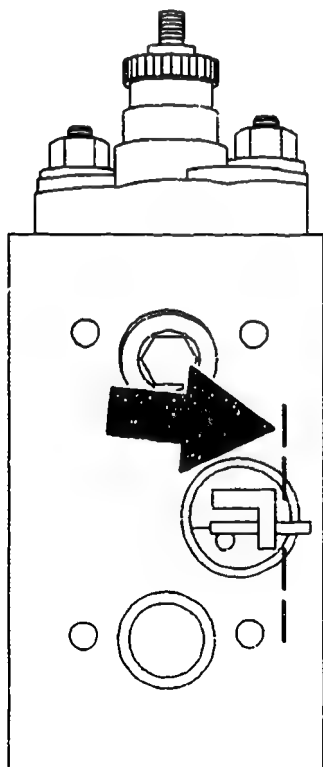
INSTALLING CONTROL ROD (MECH. GOVERNOR)

Press in new guide bushing (where necessary) on governor end with suitable sleeve such that vertical guide groove in guide bushing is parallel with pump housing (fig. a). Insert control rod.

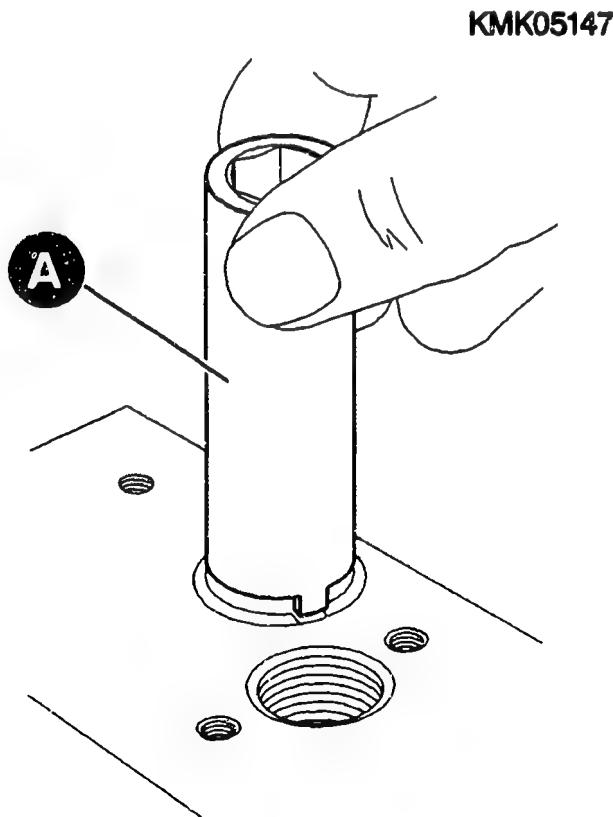
Insert straight pin in guide bushing.

Screw in threaded ring with pin-type socket wrench 0 986 612 129 (KDEP 1577 - A) and tighten to 30 ... 40 Nm (fig. b).

Continue: E18/1 Fig.: E17/2



a



b

KMK05147

INSTALLING CONTROL ROD (MECHANICAL GOVERNOR)

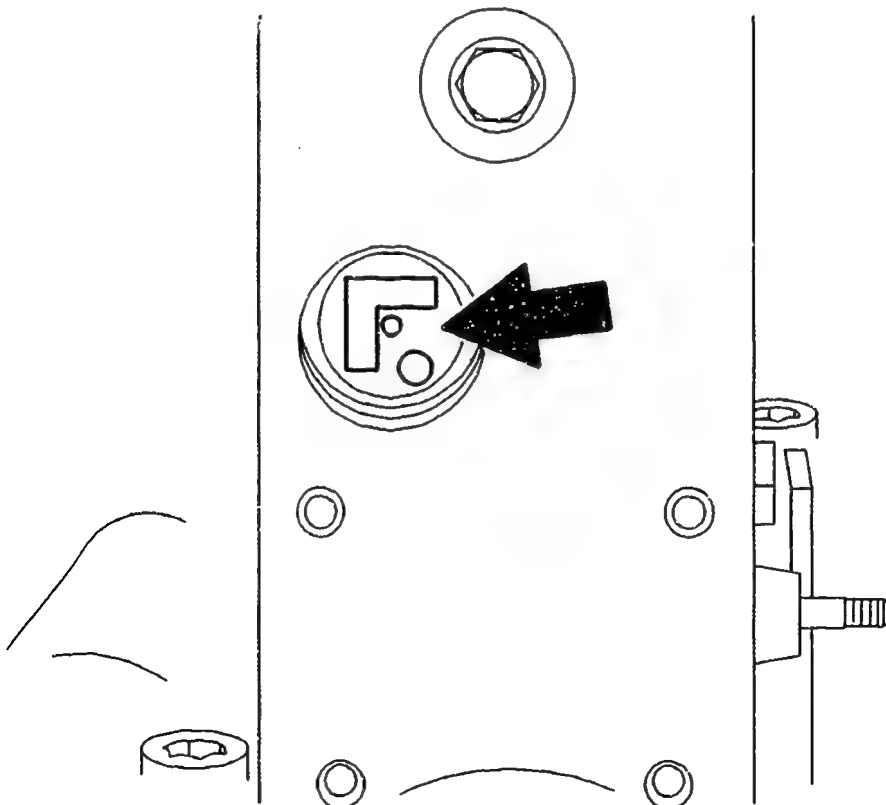
Insert guide bushing (arrow) over guide rod into housing on drive end (guide bushing does not have interference fit).

Screw in plug with sealing ring and tighten to 30 ... 40 Nm.

Check whether control rod moves freely.

Continue: E19/1 Fig.: E18/2

KMK01281



INSTALLING CONTROL ROD

Screw in guide screw by hand until contact is made with control rod at point A.

Screw out guide screw as far as contact point B.

Screw guide screw back in again by half the distance screwed back (point C).

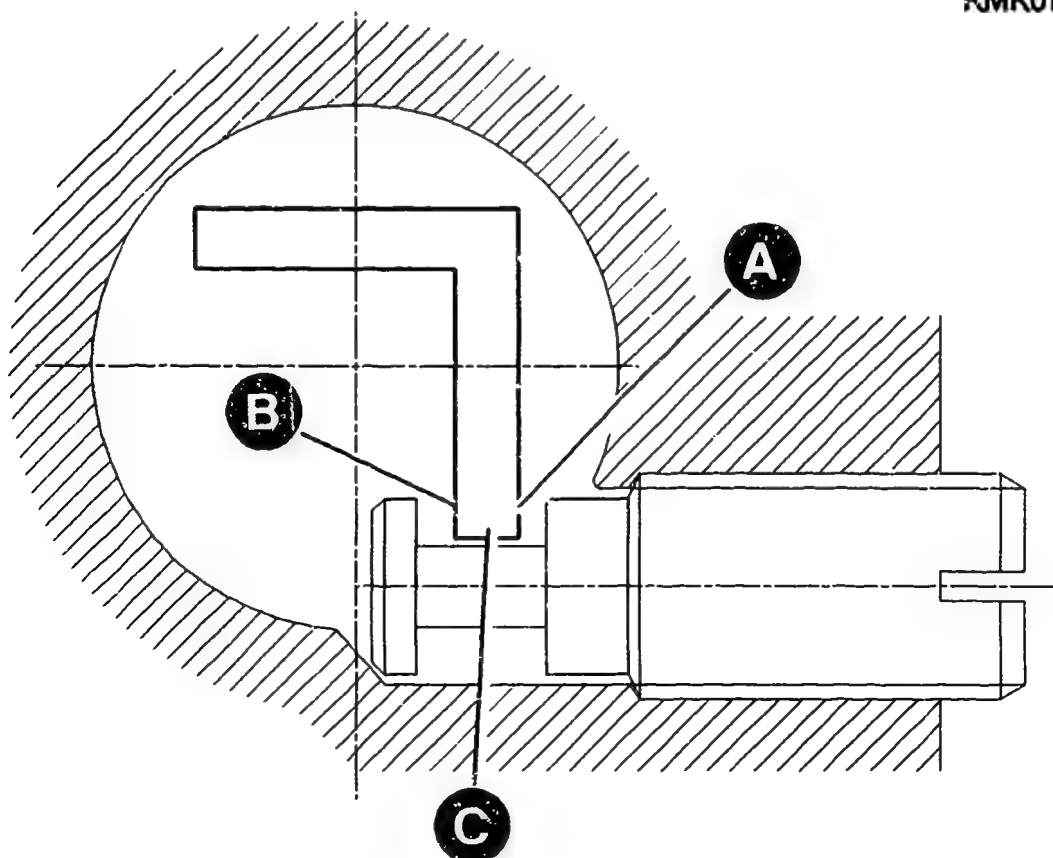
Tighten lock nut and cap of control-rod guide screw.

Torque, lock nut: 15...18 Nm

Torque, cap: 12...15 Nm

Continue: E20/1 Fig.: E19/2

KMK01282



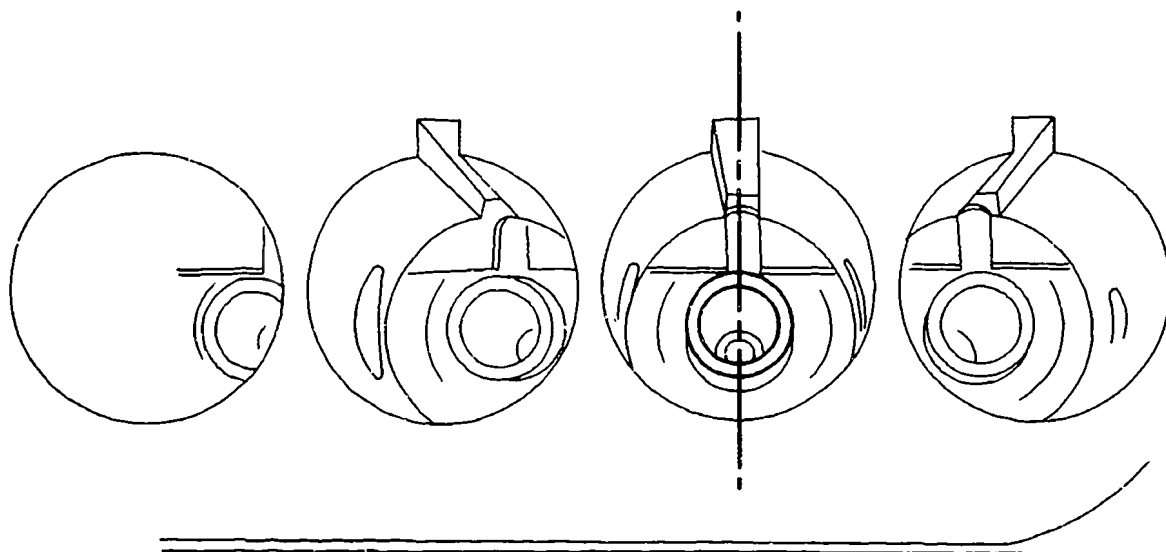
INSERTING CONTROL SLEEVES

Move control rod to center position.

Drive-hub slots in control rod for control sleeve coincide with roller-tappet guides in pump housing.

Continue: E21/1 Fig.: E20/2

KMK01283

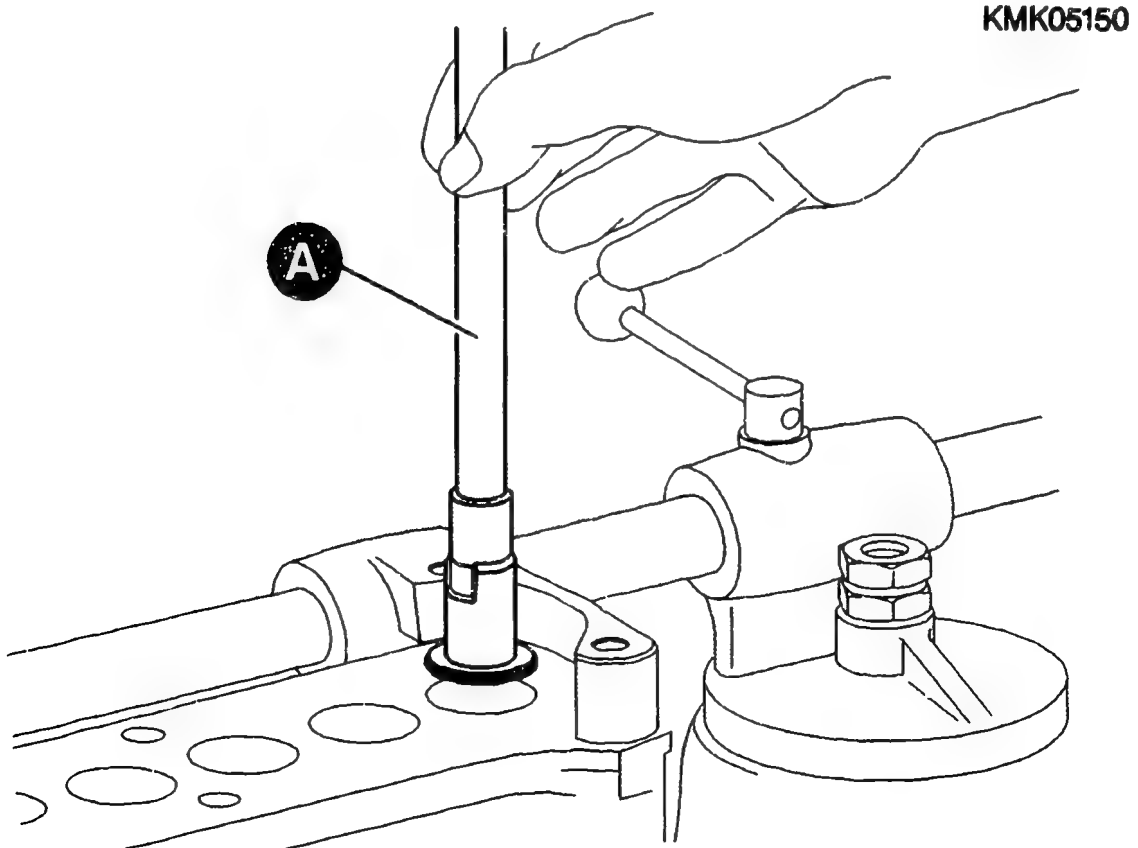


INSERTING CONTROL SLEEVES

Insert control sleeve with assembly tool 0 986 611 738 (KDEP 1071 - fig. A) such that drive-hub balls of control sleeves engage with drive-hub slots in control rod.

When doing so, keep a constant check on freedom of movement of control rod.

Continue: E22/1 Fig.: E21/2

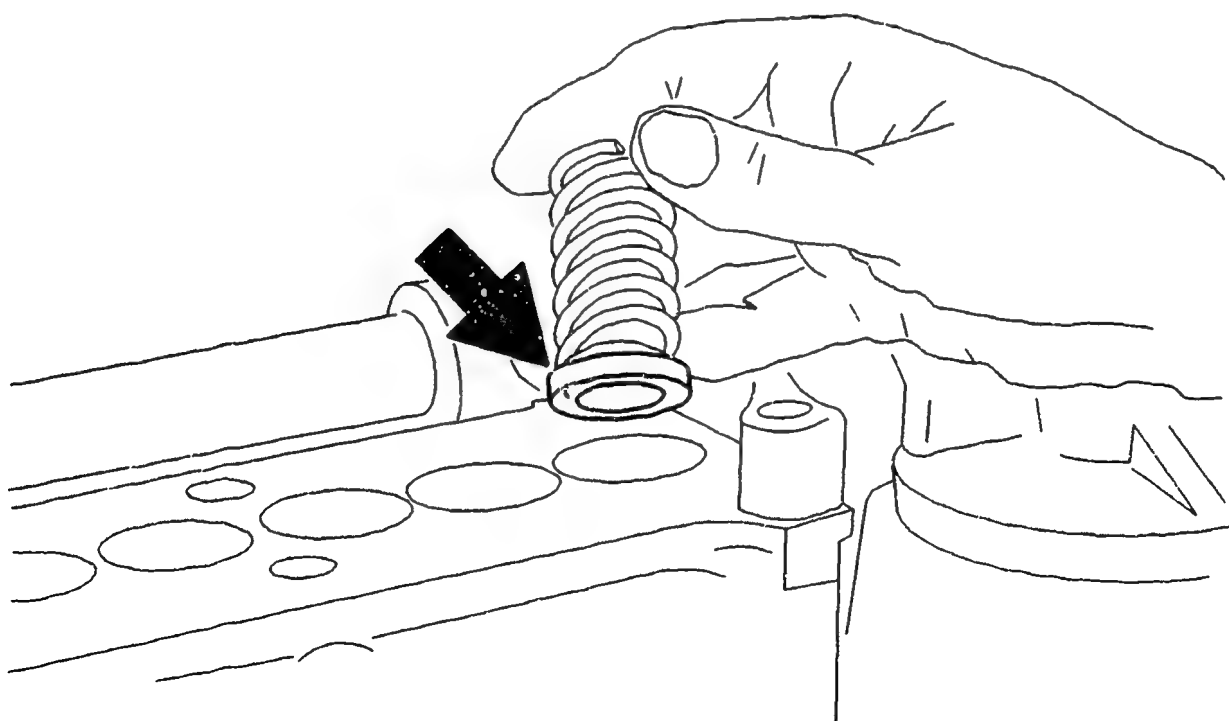


INSERTING COMPRESSION SPRING

Stick compression spring into upper spring seat with grease and insert into pump housing.

Continue: E23/1 Fig.: E22/2

KMK01285



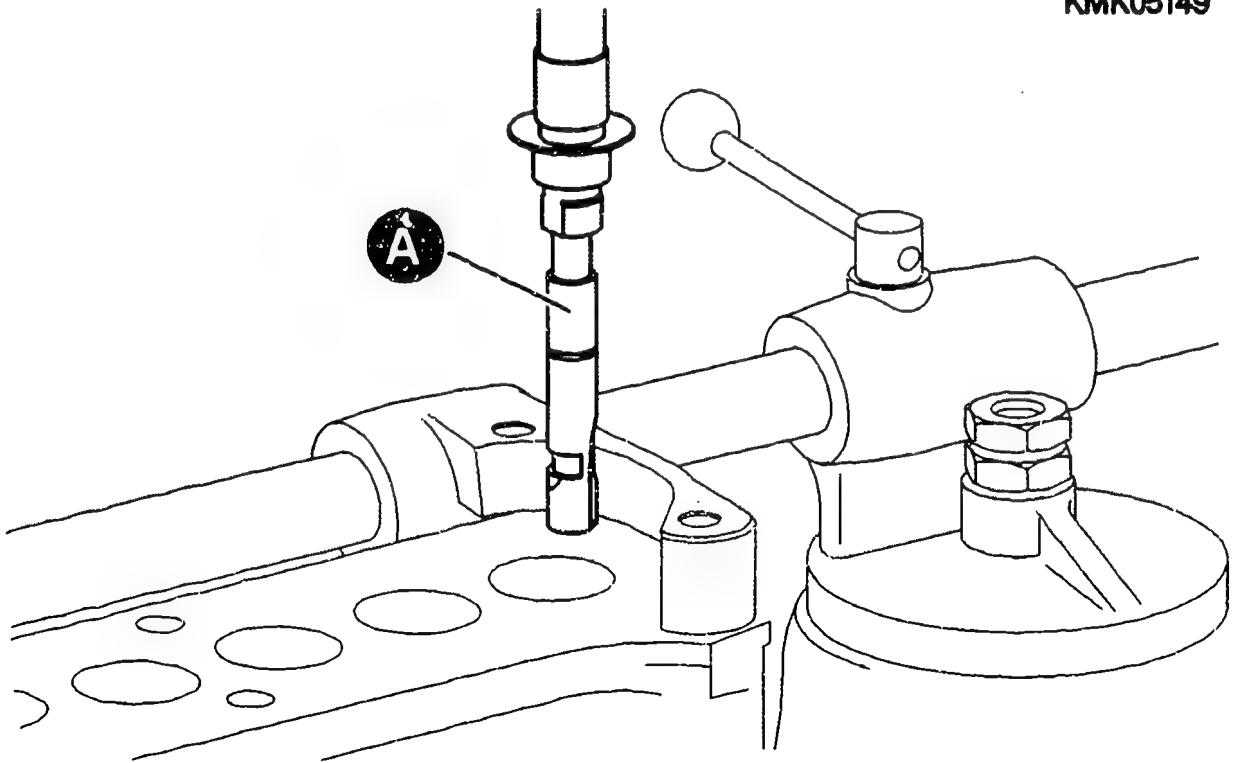
INSERTING PUMP PLUNGER

Push lower spring plate onto base of pump plunger.

Insert pump plunger and spring plate with pliers 0 986 612 120 (KDEP 1575 - fig. A) in pump barrel such that mark on plunger lug points towards back of pump (control rod).

Continue: E24/1 Fig.: E23/2

KMK05149



FITTING ROLLER TAPPET

Safety measure:

The procedure outlined in the Section "FITTING ROLLER TAPPET" must be performed with extreme care. When carrying out this operation, there is a possibility of sudden tappet-spring release and thus a DANGER OF INJURY !

Continue: E25/1

INSTALLING ROLLER TAPPET

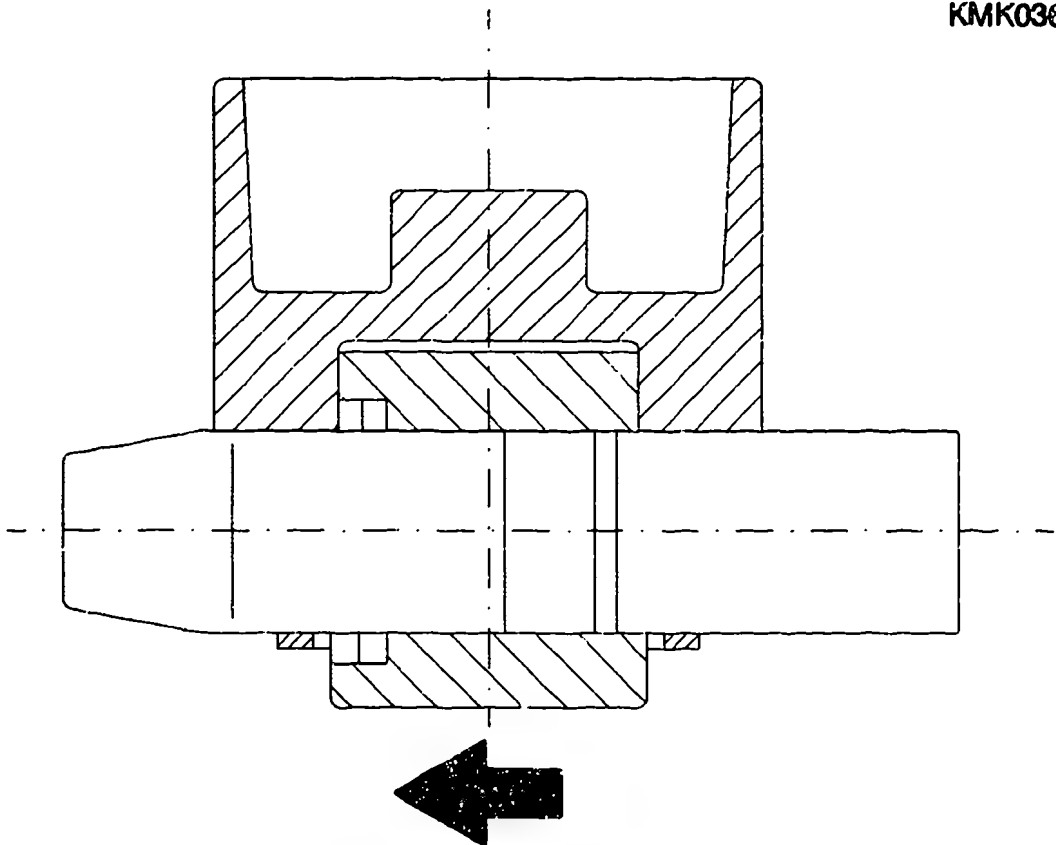
Insert retainer and tappet roller in roller-tappet shell.

On side opposite retainer insert centering mandrel 0 986 642 492 tapered side first through hole.

Insert roller pin notch first through hole in same direction as centering mandrel.

Continue: E26/1 Fig.: E25/2

KMK03854



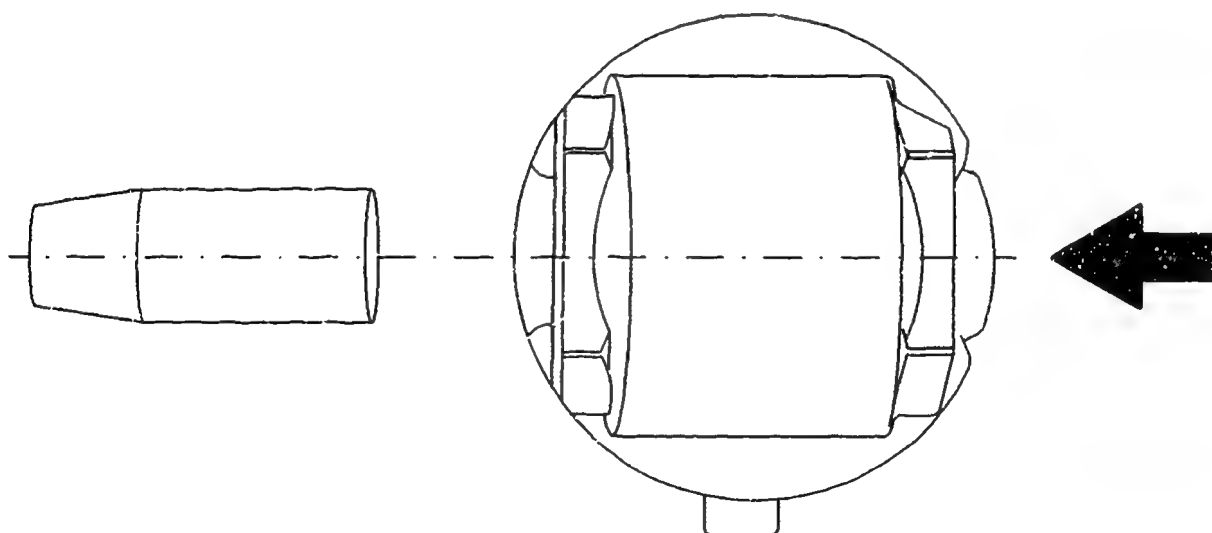
INSTALLING ROLLER TAPPET

The procedure described pushes the centering mandrel through the roller pin out of the hole.

Press roller pin into hole until retainer is felt to engage in notch.

Continue: E27/1 Fig.: E26/2

KMK03655



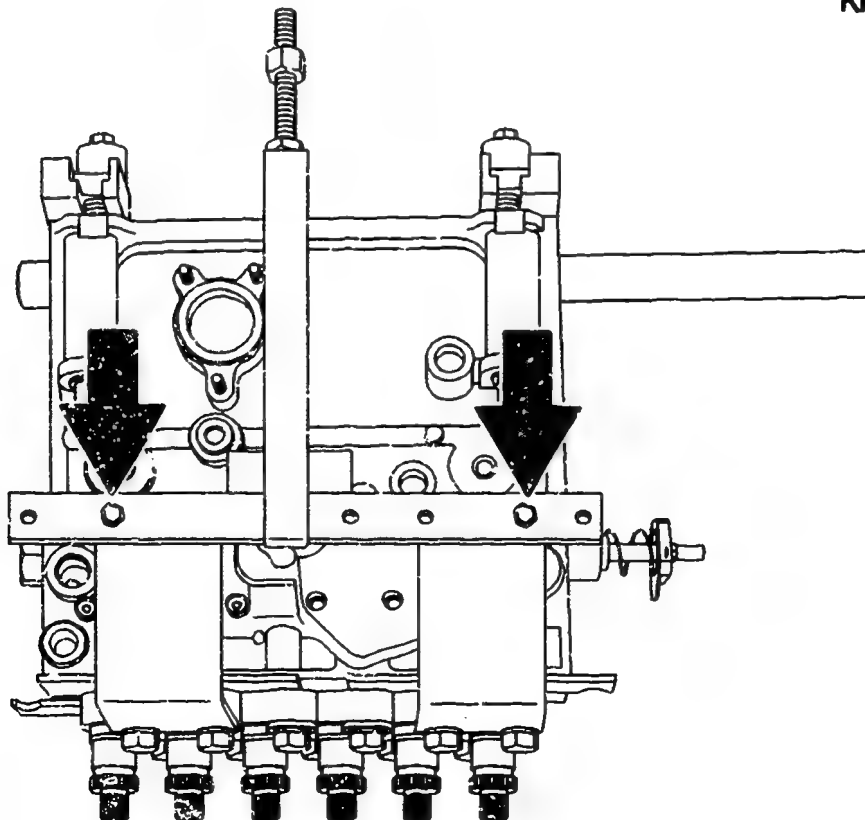
FITTING ROLLER TAPPETS

Attach assembly device 0 986 612 072 (KDEP 1556) to angular holders 0 986 612 636 (arrow).

Clamp entire assembly tool unit with angular holders in position at stud bolts of barrel-and-valve assemblies.

Continue: E28/1 Fig.: E27/2

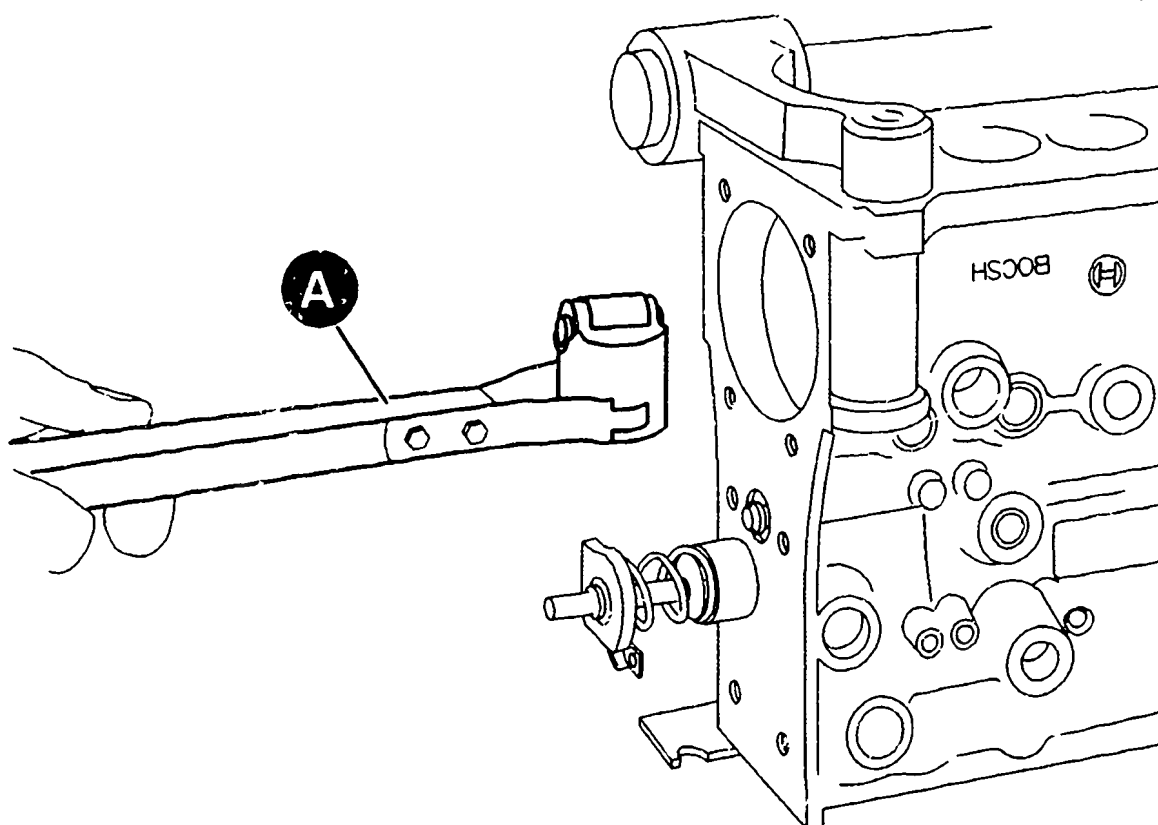
KMK05228



FITTING ROLLER TAPPETS

Clamp roller tappet in tappet forceps 0 986 611 298 (KDEP 2941 - fig. A) and insert through opening in bearing end plate into camshaft chamber in such a manner that position of sliding block for guiding roller tappet coincides with guide groove of roller tappet bore in pump housing.

Continue: F01/1 Fig.: E28/1



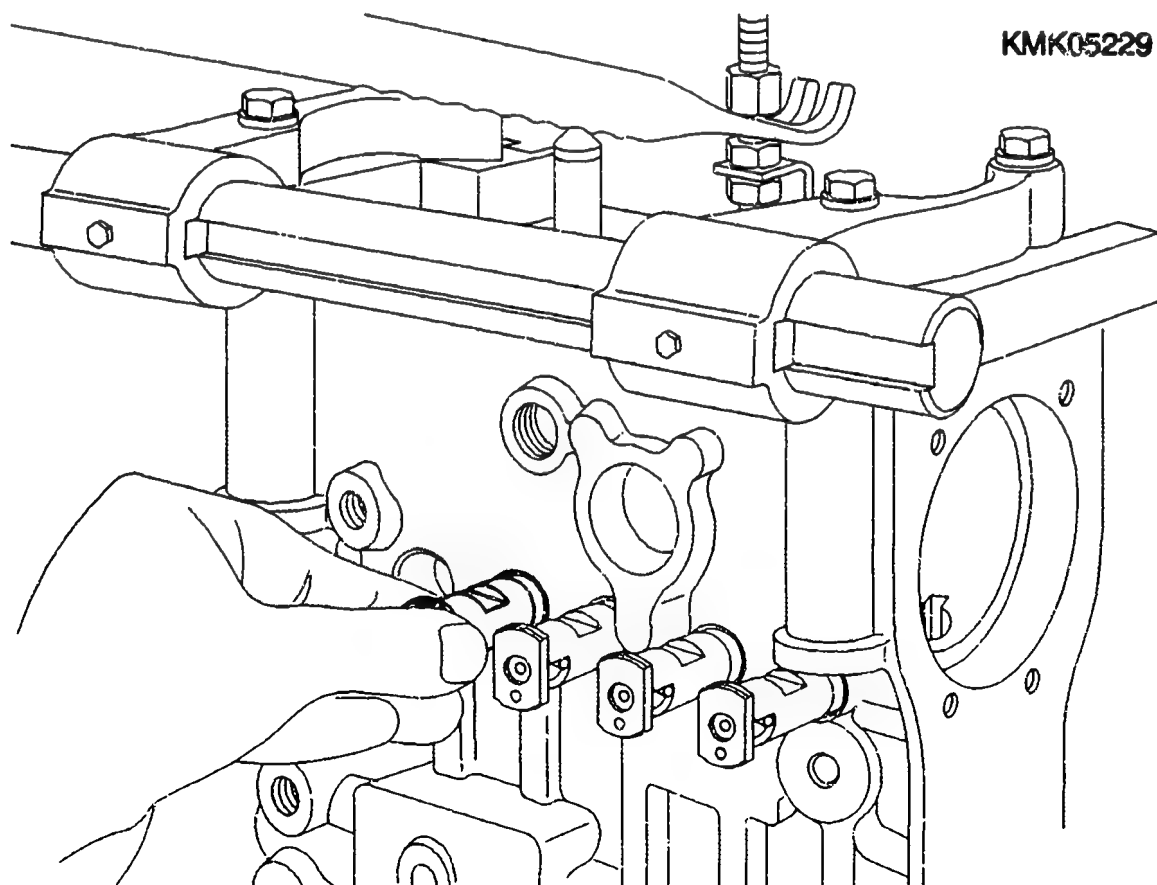
KMK05142

FITTING ROLLER TAPPETS

Attach tubular lever of assembly tool 0 986 611 993 (KDEP 1505) to retaining pin of assembly device 0 986 612 072 (KDEP 1556).

Position thrust pin on roller of first roller tappet. Carefully press roller tappet into tappet hole in housing such that tappet holder 0 986 612 482 can be inserted as far as housing stop.

Continue: F02/1 Fig.: F01/2



FITTING ROLLER TAPPETS

Milled surface of tappet holder must be horizontal and point towards cam-shaft chamber of pump.

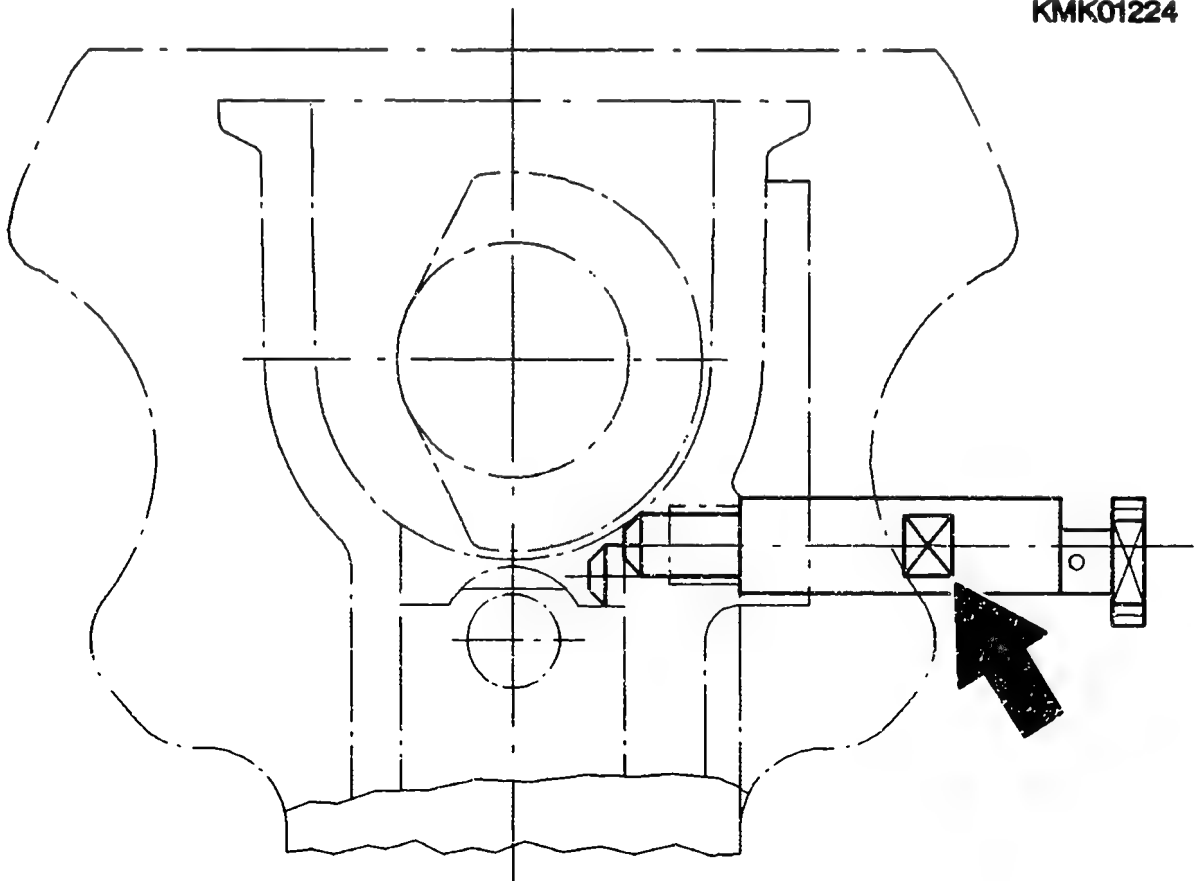
Note:

If roller tappet cannot be inserted far enough, move control rod with tubular lever detensioned until roller tappet can be completely pressed into its guide hole.

Remove assembly device 0 986 612 072 (KDEP 1556).

Continue: F03/1 Fig.: F02/2

KMK01224



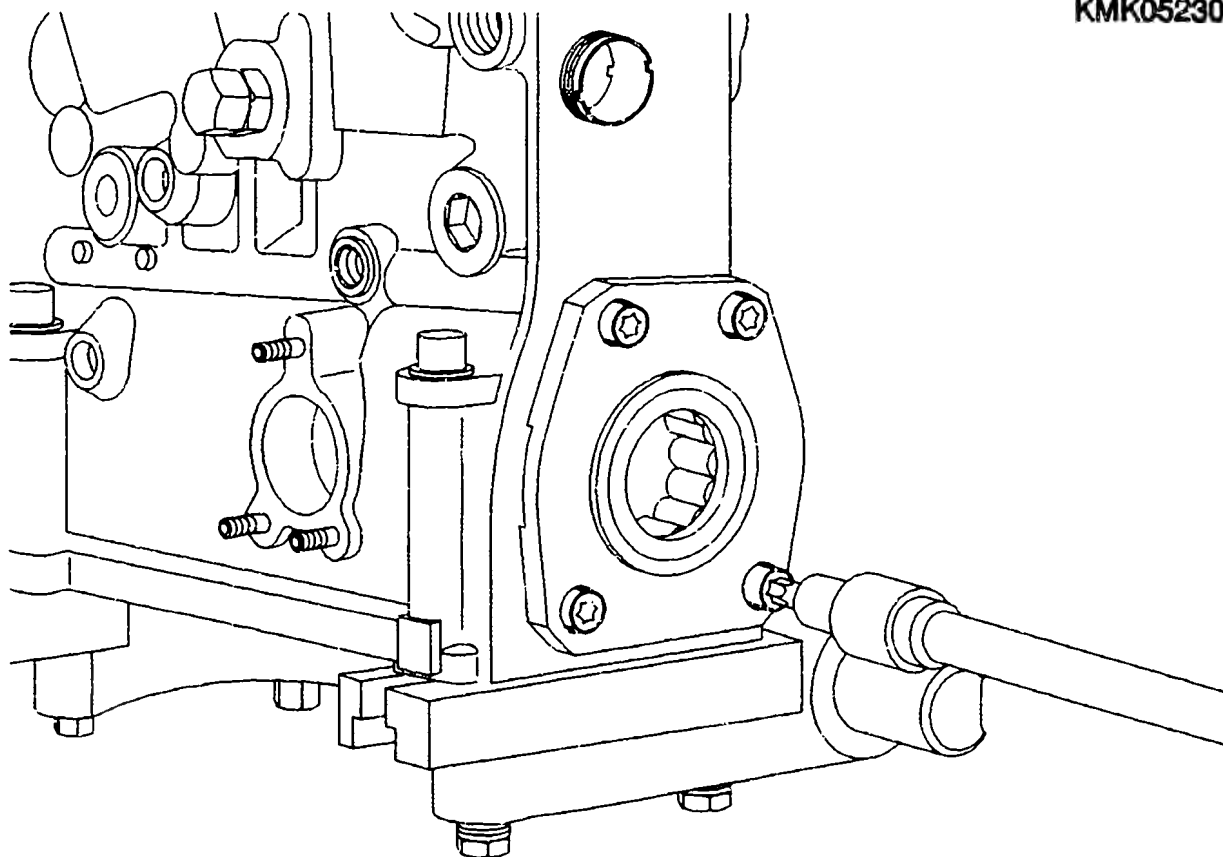
INSTALLING CAMSHAFT

Fit bearing end plate on drive end.

Perform operation carefully, as rollers are loose in bearing outer race.

Continue: F04/1 Fig.: F03/2

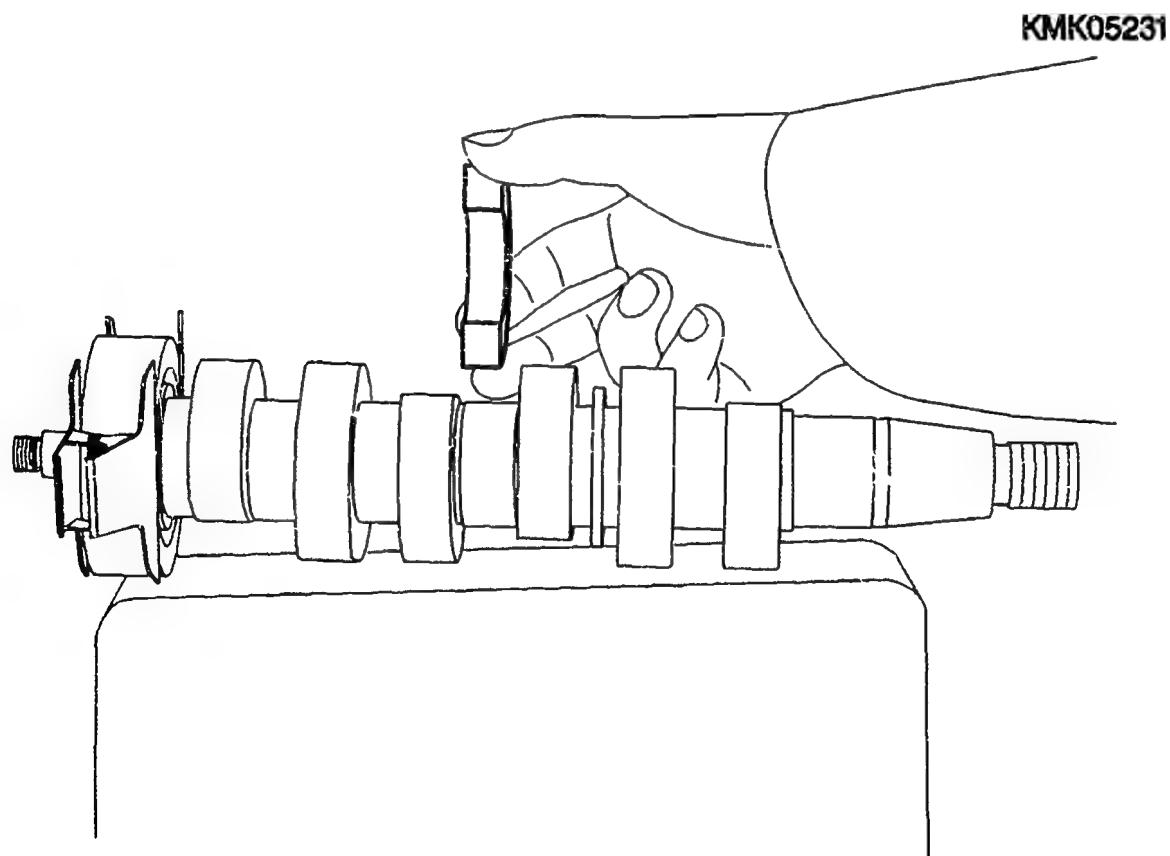
KMK05230



INSTALLING CAMSHAFT

Apply small quantity of grease to intermediate bearing and press onto camshaft.

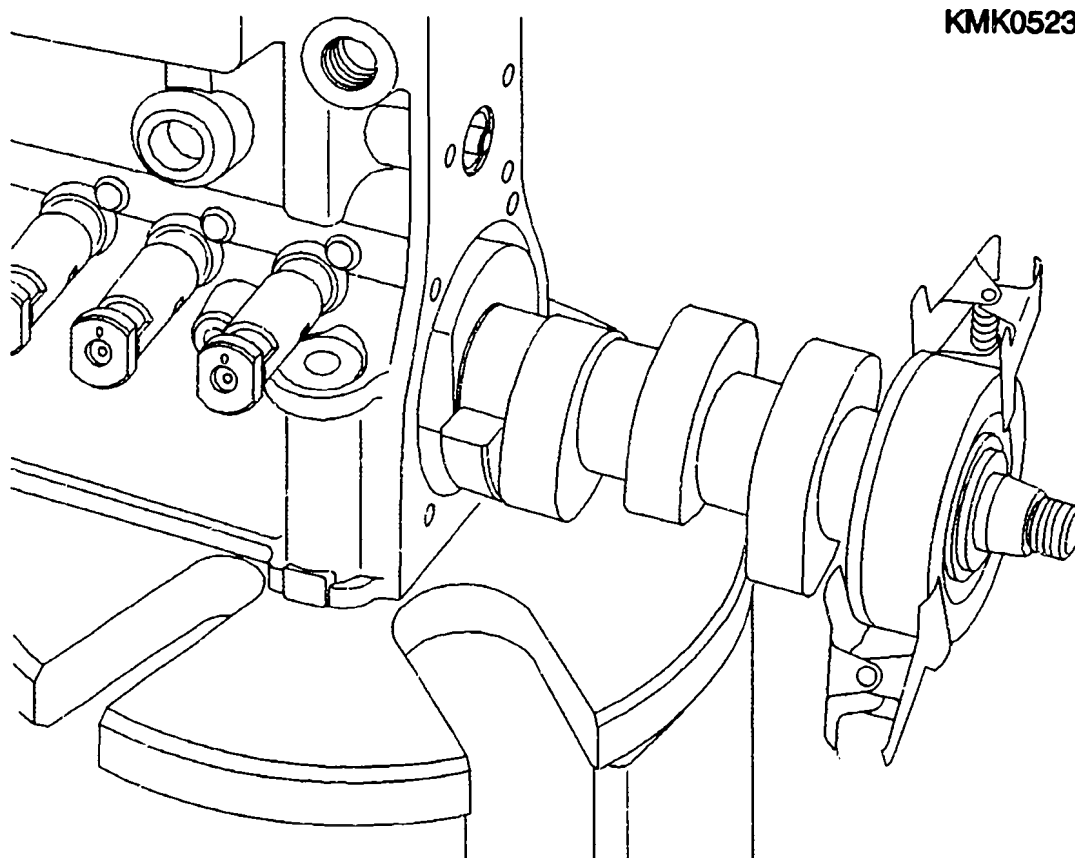
Continue: F05/1 Fig.: F04/2



INSTALLING CAMSHAFT

Insert camshaft into camshaft chamber of fuel-injection pump.

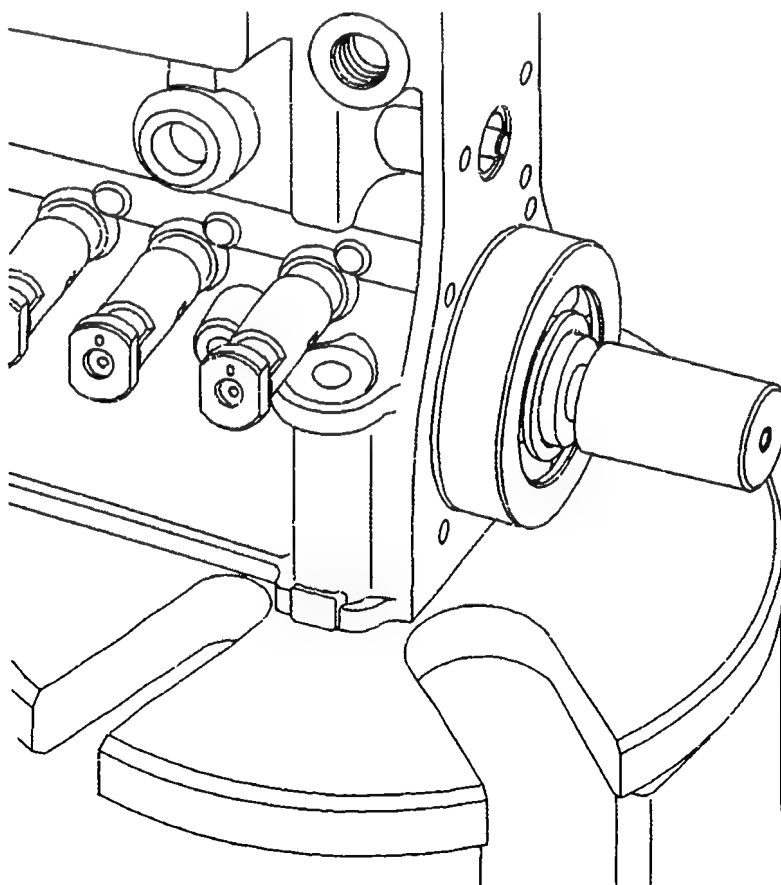
Continue: F06/1 Fig.: F05/2



INSTALLING CAMSHAFT

Screw guide bushing 0 986 612 493 to camshaft and remove retaining clamps for roller bearing.

Continue: F07/1 Fig.: F06/2



KMK05233

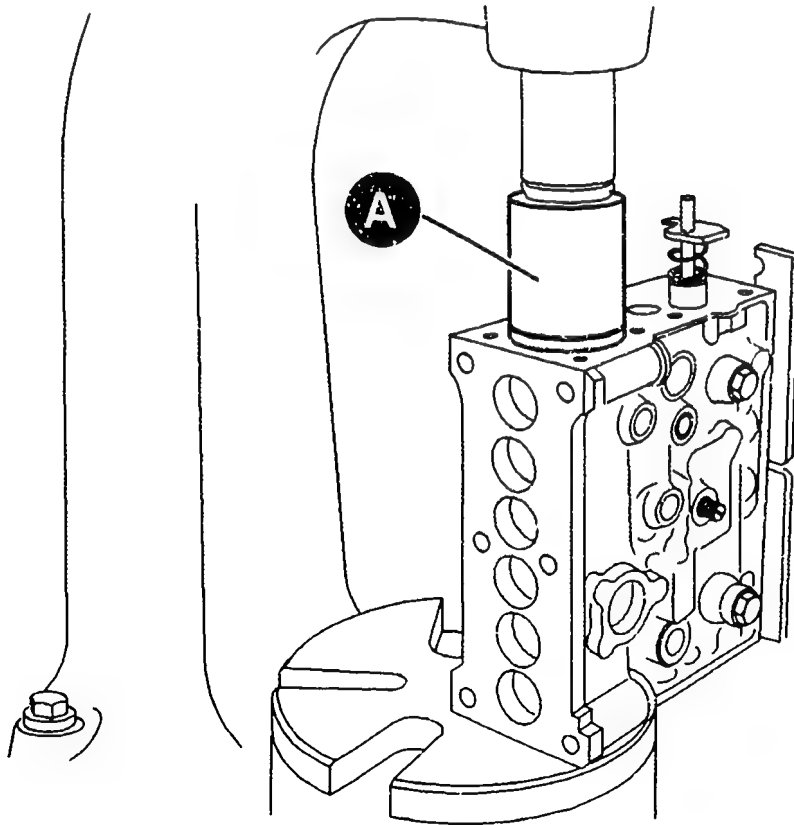
INSTALLING CAMSHAFT

Attach adapter ring 0 986 612 647 to body of pressing-in tool 0 986 612 065. Slip body over guide bushing 0 986 612 493 (machined shoulder points towards ram of press) and press outer race of governor-end roller bearing into pump housing.

In the case of pumps with end flange and assembly plate fitted, it is advisable to use the support ring 0 986 612 106 (KDEP 1568) for the pump. Unscrew guide bushing.

Continue: F08/1 Fig.: F07/2

KMK05148

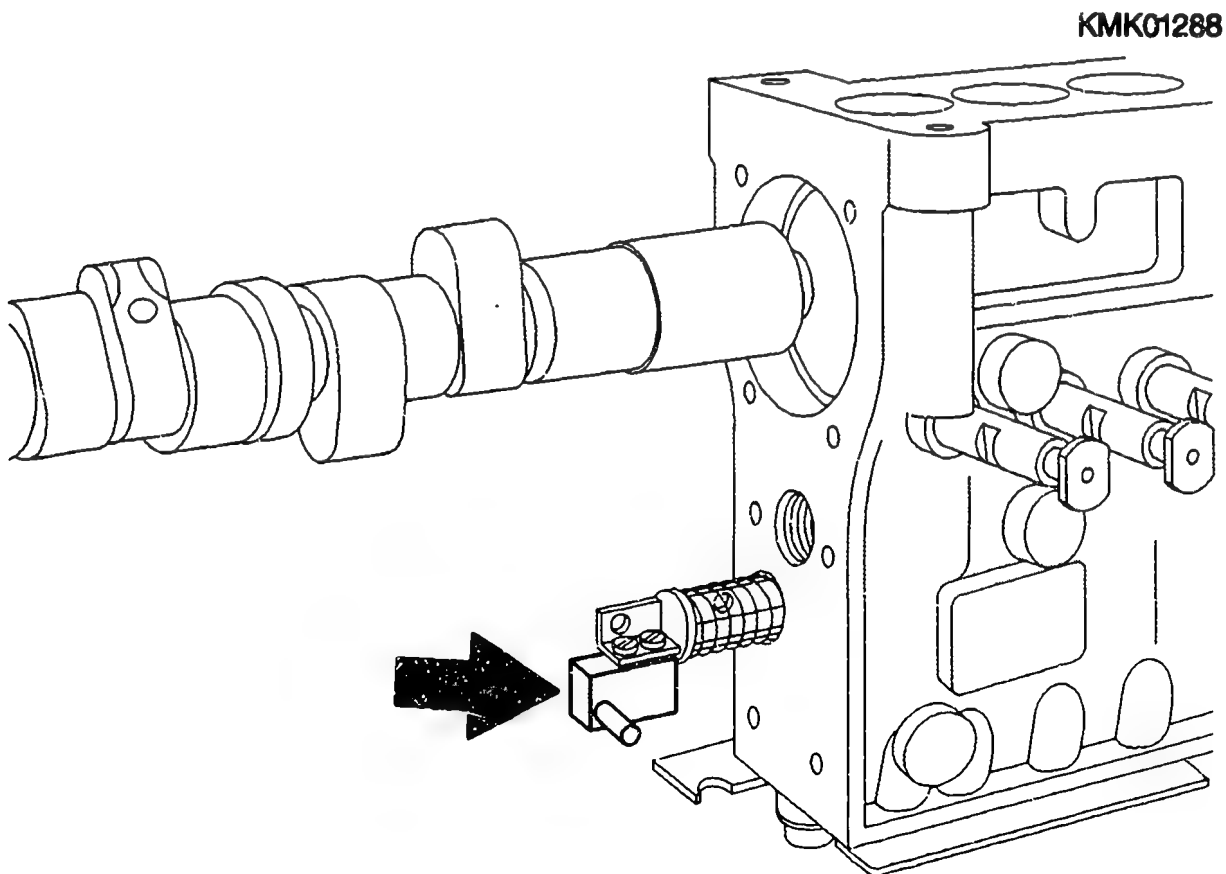


INSTALLING CAMSHAFT

Fit play-compensating spring of guide rod and connecting link (arrow); only applies to mechanical governor.

Bolt tightening torque, connecting link - control rod: 4 ... 5 Nm.

Continue: F09/1 Fig.: F08/2



INSTALLING CAMSHAFT

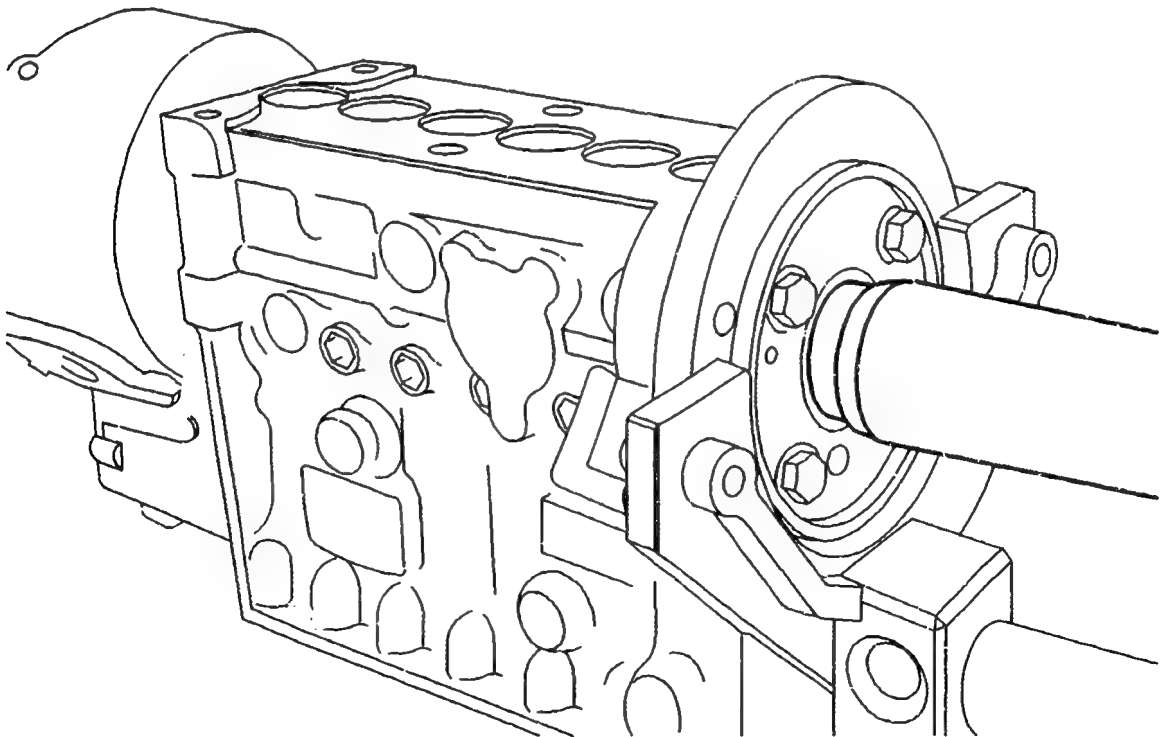
Without applying grease, slip radial-lip-type oil seal on drive end over assembly sleeve 0 986 612 060 (KDEP 1549) and camshaft.

Use pressing-on tool 0 986 612 085 (KDEP 1559) to press radial-lip-type oil seal into recess provided for this purpose in bearing end plate. For taper 40 use pressing-on tool 0 986 612 647.

To facilitate installation apply talcum powder to outer ring of radial-lip-type oil seal.

Continue: F10/1 Fig.: F09/2

KMK01291



INSTALLING CAMSHAFT

Screw new fastening screws (1) with resilient sleeves (2) into intermediate bearing (picture a).

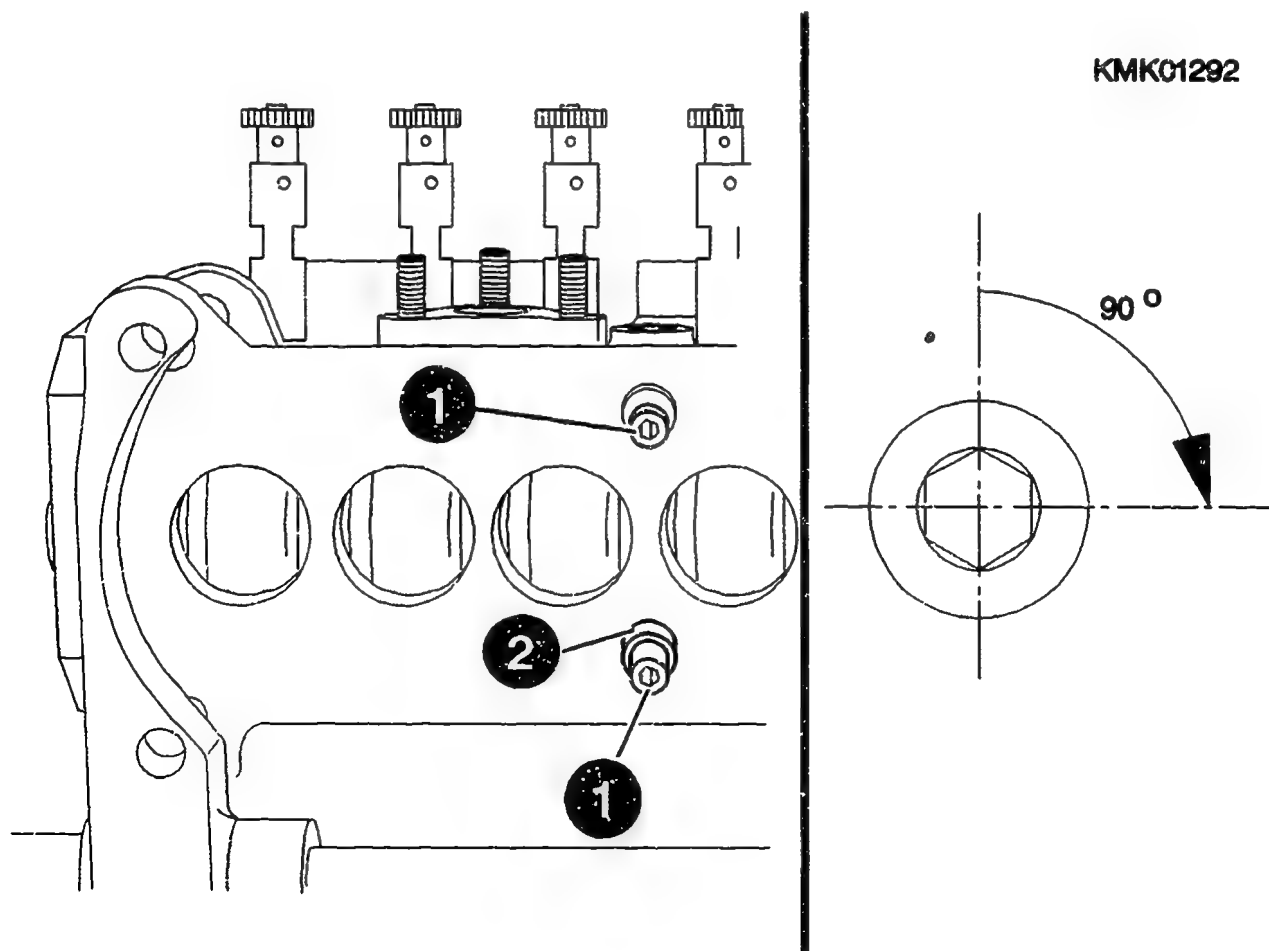
Tighten screws to pre-tightening torque of 7 ... 9 Nm.

Then turn screws by a further 90 degrees and secure (picture b).

Note:

The tightening specification in line with the angle tightening method must be adhered to, in order to guarantee screw tightness and freedom from leaks.

Continue: F11/1 Fig.: F10/2



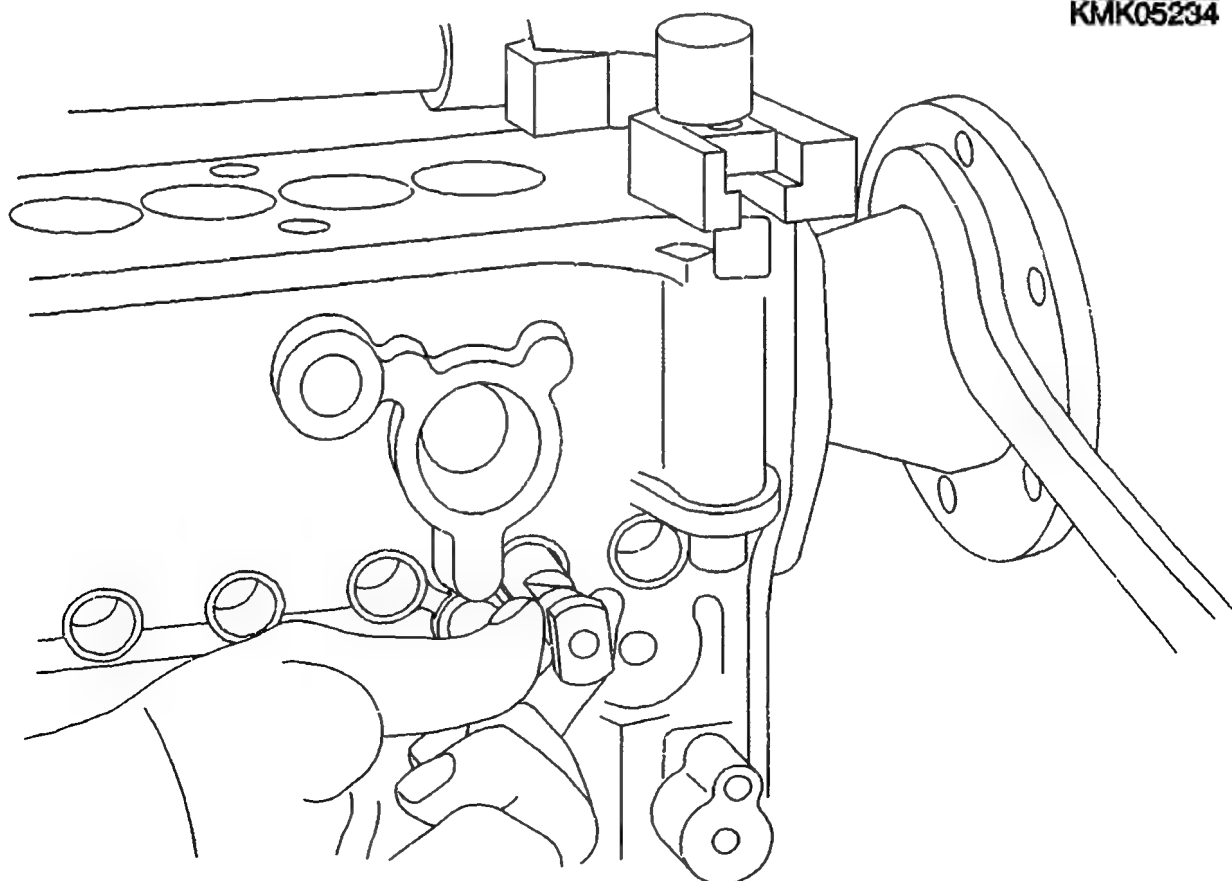
INSTALLING CAMSHAFT

Attach drive coupling to camshaft taper on drive end.

Use hook-type wrench 1 687 950 530 to turn camshaft and gradually turn eccentric bolts of tappet holders 0 986 612 482 through 180 degrees to lower roller tappets onto cams of camshaft.

Remove tappet holders (fig.).

Continue: F12/1 Fig.: F11/2

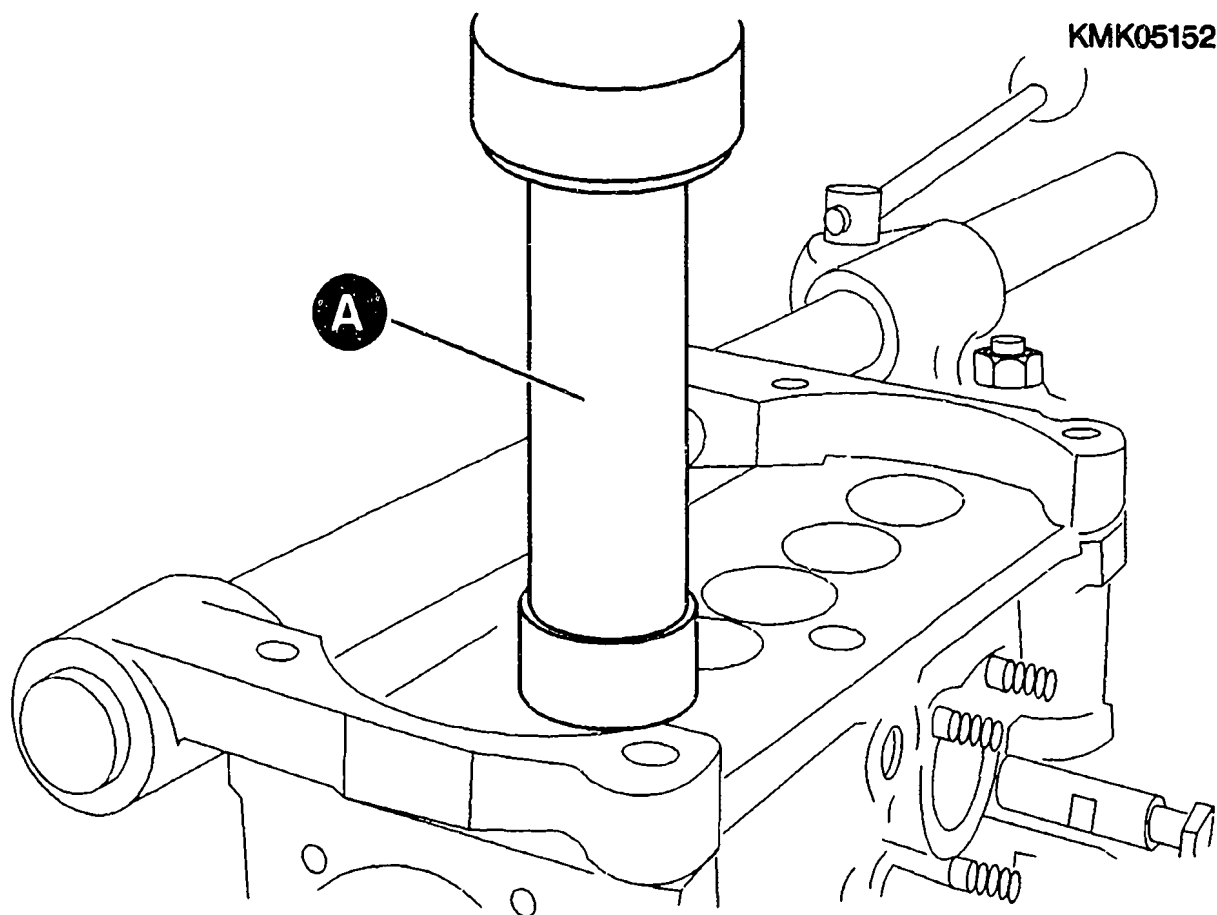


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INSTALLING CAMSHAFT

Use pressing-in mandrel 0 986 612 119 (KDEP 1574 - fig. A) to press base covers into assembly holes on bottom of housing.

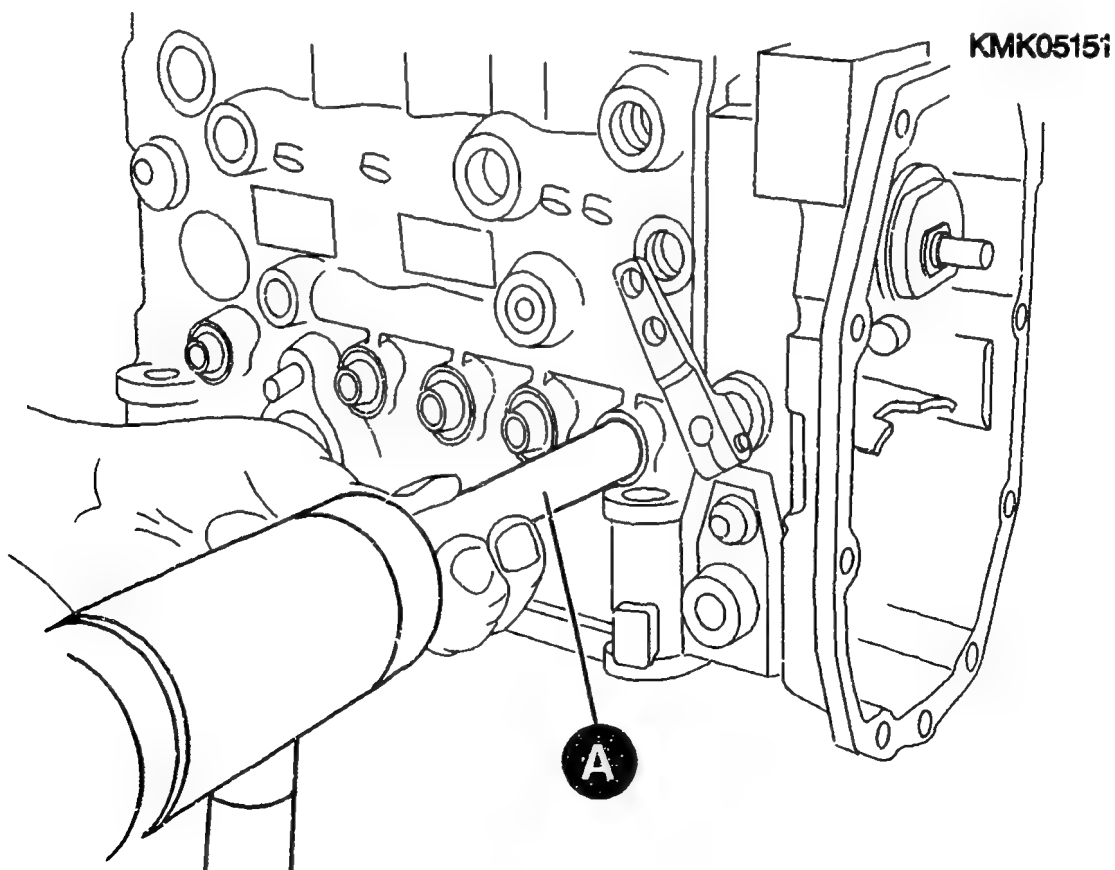
Continue: F13/1 Fig.: F12/2



INSTALLING CAMSHAFT

Seal mounting holes for tappet holders with new metal plugs using pressing-in mandrel 0 986 612 156 (KDEP 1598 - fig. A).

Continue: F14/1 Fig.: F13/2



INSTALLING PRESTROKE SHIMS

Loosen fastening nuts of barrel-and-flange elements.

Remove spacers 0 986 612 061 (KDEP 1550).

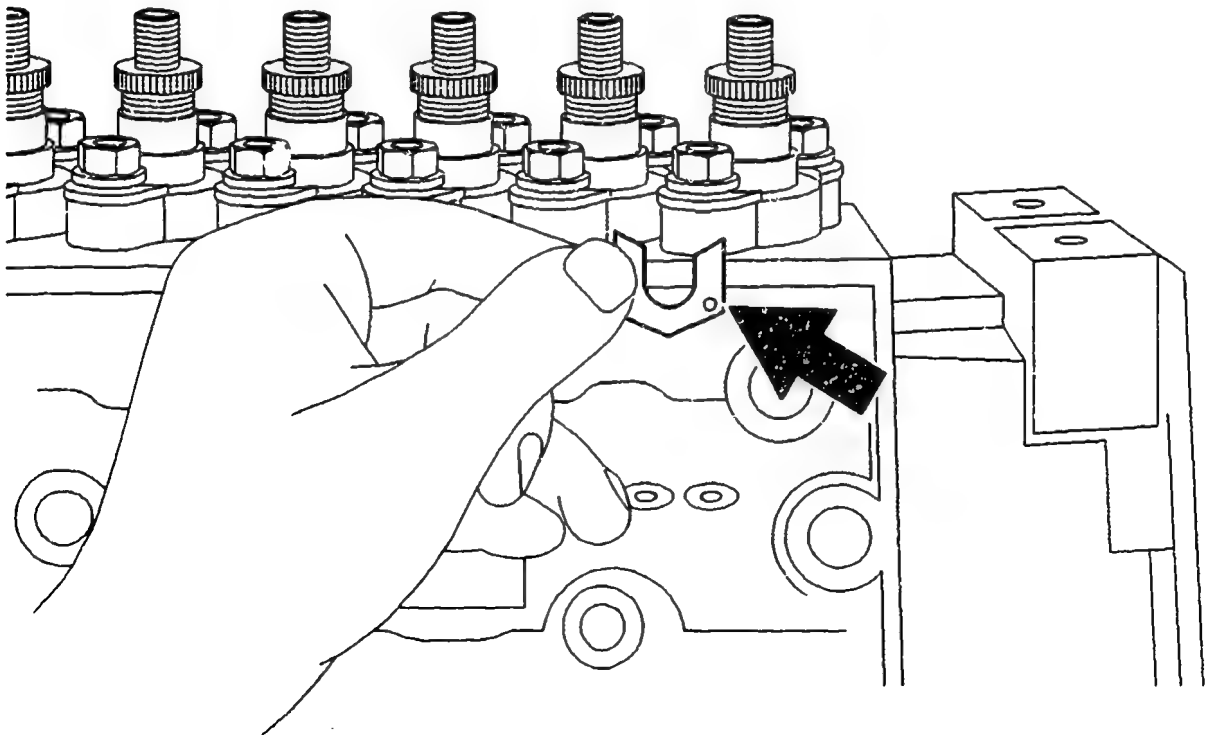
Insert prestroke shims beneath assembly flanges in same configuration as they were prior to pump disassembly (arrow).

Tighten fastening nuts to 40 ... 45 Nm .

Check freedom of movement of control rod.

Continue: F15/1 Fig.: F14/2

KMK01296



ATTACHING GOVERNOR

**Assemble governor in line with
respective repair instructions.**

Note:

**Use new, microencapsulated screws on
assembly.**

Continue: F16/1

LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

Completely assemble pump (picture).

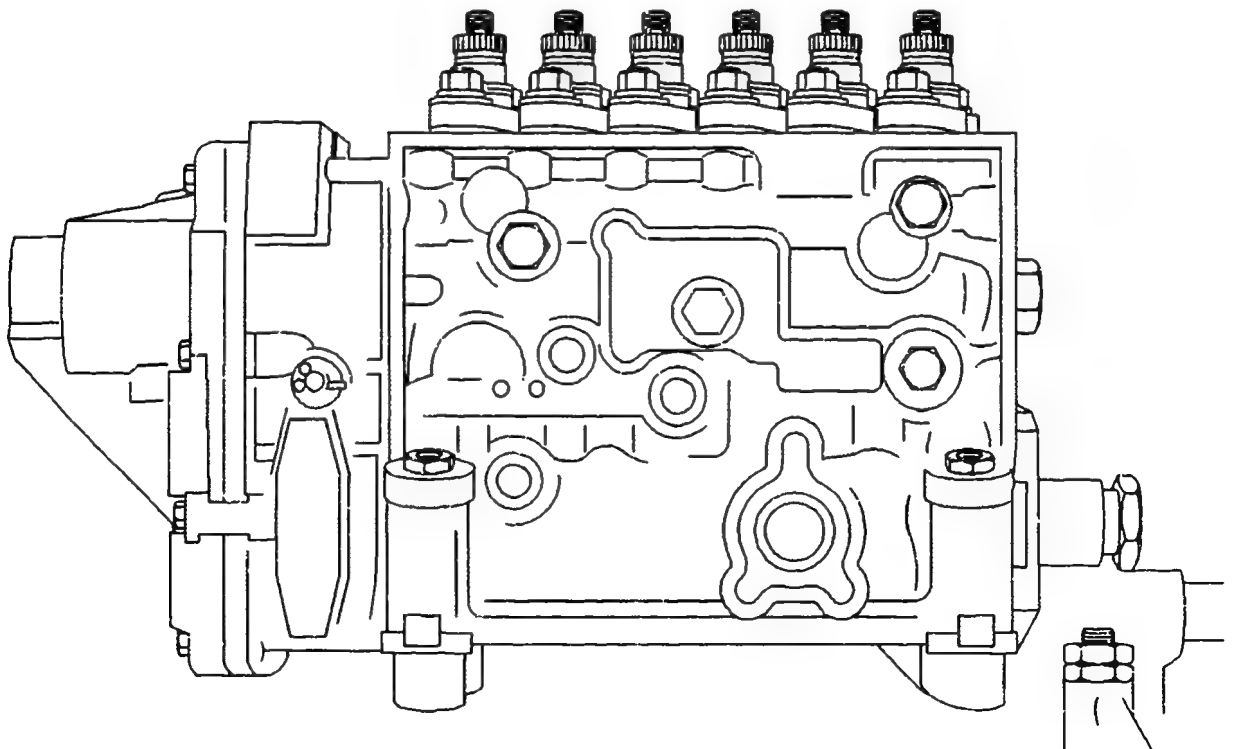
Supply the compressed air required for the leak test to the camshaft chamber at a suitable location (e.g. oil check hole).

Immerse pump perpendicularly into test bath.

The delivery-valve holders must not be flooded with calibrating oil.

Continue: F17/1 Fig.: F16/2

KMK01215



LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

Note:

To avoid the possibility of skin irritation, apply protective cream to hands before starting test and wash hands in soap and water upon completion of testing. Wear rubber gloves if possible.

Continue: F17/2

LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

* 7 minutes at 1.5 bar, then
1 minute at 0.5 bar.

Perform visual inspection to establish whether all sealing surfaces, unions, sealing rings and end covers on housing and cover are leakproof.

There must be no visible air bubbles.

Set fuel-injection pump on pump test bench.

Continue: A01/1

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Continue: N28/2

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